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SYSTEMS AND FEASIBILITY TRADEOFF ANALYSES

TASK 2 REPORT (CDRL A002)

INITIAL NTIPP FUNCTIONAL REQUIREMENTS

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

SUBMITTED TO

DAVID W. TAYLOR NAVAL SHIP R&D CENTER (CODE 186A)

CONTRACT NO. N00600-76-C-1352

HUGHES
HUGHES AIRCRAFT COMPANY
GROUND SYSTEMS GROUP
FULLERTON, CALIFORNIA

SUBMITTED BY
NTIPP PROJECT
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24 MARCH 1977

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This Task 2 report documents the preliminary requirements established as the output of the second of seven tasks in Phase I, Systems and Feasibility Tradeoff Analyses (SFTOA) within the Navy Technical Information Presentation Program (NTIPP) under the above-cited contract number. → next page

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Navy Technical Manual System (NTMS)
Planned Maintenance System (PMS)
Reading Grade Level (RGL)
Systems and Feasibility Tradeoff Analyses (SFTOA)
Technical Manual (TM)
Technical Manual Contract Requirements (TMCR)
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User-Data Match
Weapon System Acquisition Process (WSAP)

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The technical approach to Task 2 involved the application of engineering judgment to the information base produced in Task 1, Analysis of Current and Proposed Technical Manual Systems. Requirements have been synthesized at the overall NTIPP level and at the level of the nine Research Issues which continue to be used as focal points around which the SFTOA research is conducted.

SYSTEMS AND FEASIBILITY TRADEOFF ANALYSES

Task 2 Report (CDRL A002)

Initial NTIPP Functional Requirements

Submitted to

David W. Taylor

Naval Ship R&D Center (Code 186A)

In Accordance with

Contract No. N00600-76-C-1352

by

Hughes Aircraft Company
Ground Systems Group
Fullerton, California

24 March 1977
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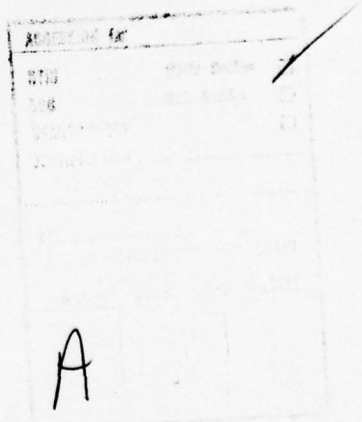

FOREWORD

Hughes Ground Systems Group is pleased to submit this Task 2 Report, identified as CDRL Item A002, to the David W. Taylor Naval Ship Research and Development Center (DTNSRDC), Bethesda, Maryland, in accordance with Contract N00600-76-C-1352 for the Navy Technical Information Presentation Program (NTIPP). This contract is under the technical management of Mr. R. A. Sulit and Mr. J. J. Fuller, both of DTNSRDC Code 186A.

Task 2 is the second of seven contractual tasks in NTIPP Phase I – Systems and Feasibility Tradeoff Analyses. The purpose of Task 2 is to establish the initial NTIPP functional requirements for preliminary baseline development (Task 3). These requirements will serve as a threshold which must be satisfied by all viable alternatives before such alternatives qualify for consideration in the baseline process.

Performing organization personnel who participated in the Task 2 effort and with the preparation of this report include the following individuals, with principal investigators identified by asterisk:

J. E. Connell (Program Manager)
D. W. Gater
J. W. Kelsey
*R. J. Kennihan (User-Data Match)
*A. Laicato (Content Generation, Update, and Integration)
*C. E. Marvin (Data Acquisition)
H. A. McDougal
*R. C. Sisman (Content Capture and Replication)
*W. L. Taylor (Distribution and Feedback)
D. R. Wilkins
W. F. Ziegler

EXECUTIVE SUMMARY

1. PROBLEM ADDRESSED BY THE TASK 2 EFFORT

The role of Task 2 is to establish a set of requirements which suitably constrain the initiation and conduct of the NTIPP baselining process. This Task 2 report presents preliminary NTIPP requirements which have been subjected to Navy review and resultant modification before final issue.

The Navy Technical Information Presentation Program (NTIPP) consists of four phases: Phase I – Systems and Feasibility Trade-off Analyses (SFTOA); Phase II – System Design, Pilot Testing, and Prototype Specifications Development; Phase III – Prototype Development and Test; and Phase IV – Prototype Operation and Production Specifications Development. This report documents Task 2, Establishment of NTIPP Requirements, which is the second of seven SFTOA tasks in Phase I.

The need for NTIPP requirements is apparent when one considers that the familiar system engineering process of iterative baselining begins with SFTOA Task 3, wherein alternatives are synthesized from the information base of Task 1 and compared, and a preliminary selection made of preferred candidate tachniques at the lower levels, the Research Issue level, and the overall NTIPP level. To avoid design divergence through inadvertent consideration of potentially infeasible or inadequate alternatives, some means must exist for qualifying potential candidates before they are admitted to consideration. The requirements established in Task 2 serve this need – they represent the threshold which all alternatives must satisfy, as a minimum, before being declared to be viable, bona fide candidates for further consideration in the baselining process.

The procedure by which Task 2 requirements came into existence is straightforward. Engineering judgment was applied to the information base produced in Task 1, Analysis of Current and Proposed Technical Manual Systems,* to determine areas of adequacy and deficiency, and a requirements envelope developed which retained the areas of present/proposed adequacy while imposing requirements whose subsequent satisfaction will compensate for the deficiencies and gaps in coverage exhibited by the current and presently proposed technical manual systems.

The requirements developed during Task 2 and documented herein have undergone Navy review between the issue of the draft and final versions of this Task 2 report.

*As documented in NTIPP CDRL A001, Task 1 Report, Hughes Aircraft Company, Ground Systems Group, Fullerton, California, dated 24 March 1977.

2. APPROACH TO REQUIREMENTS FORMULATION

The technical approach to Task 2 is based upon a continuation of the application of systems engineering methodology to the NTIPP research activities, as begun in Task 2. Directly or indirectly, all NTIPP requirements are traceable back to the driving constraints of the Weapon System Acquisition Process.

The role of Task 2 is to operate on the information base produced in Task 1 and to establish a set of requirements which serve to screen potential NTIPP alternatives (the subject of Task 3), rejecting those which are inadequate or incompatible. The requirements of Task 2 therefore serve as a control mechanism, qualifying potential alternatives for further consideration within Task 3, in which preliminary selections will be made to constitute the emerging baseline for NTIPP.

The principal concern in establishing NTIPP requirements is that they serve to assure convergent design without unduly restricting the synthesis of alternatives – that is, they neither over-constrain (lest they inadvertently reject viable alternatives) nor under-constrain (lest they accept unviable alternatives into consideration). This "over-specify/under-specify" dilemma is a familiar confrontation in the systems engineering discipline; its resolution is a matter of engineering judgment.

It should be noted that Tasks 1 and 2 were performed within the same 7-month timeframe because of the close correlation required. A total of some 75 man-months was expended on the combined effort, of which about 20 are attributable to the Task 2 portion.

The primary catalyst from which NTIPP requirements arise is the set of constraints imposed by the Weapon System Acquisition Process (WSAP). NTIPP requirements are inherently groupable into a hierarchy by noting their relative level with respect to the WSAP. Hence, the first-level NTIPP requirements are those which react directly to the WSAP constraints; these are reactive in nature, and exhibit the highest degree of inflexibility to the design process. The second-level requirements are those which are derived from the first-level ones, and the process of deriving further-level requirements is continued to a level of convenience. All but the first-level requirements are derived, rather than reactive. Flexibility of the requirements is inversely related to the level; as the progression continues, the lower-level requirements are treatable in increasingly freer fashion in their application to the design process.

In this connection, first-level requirements (directly reactive to WSAP constraints) are presented in Section 3 of this report, and restated in Topic 4.9, together with the second-level requirements which represent the first occurrence of derived requirements. Further levels of derived requirements are represented by the research issue requirements in each case, which are further extended to requirements for subfunctional areas where appropriate.

3. SUMMARY OF TASK 2 CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendations drawn from the conduct of Task 2 center around the need for earlier involvement of MOTD decision-making in the WSAP cycle, and for better definition of key ILS and LSA activities to enhance their interface with the MOTD process.

The most significant conclusions and recommendations involve the top-level NTIPP requirements which are directly reactive to the constraints of the Weapon System Acquisition Process (WSAP). While lower-level requirements can be applied to the design process with various degrees of flexibility, these top-level requirements are relatively inflexible. Hence, their impaction by existing policies and procedures becomes a critical matter which is worthy of incorporation in Task 2 conclusions and recommendations even where the resolution may lie outside the purview of NTIPP.

Because they correspond to the principal WSAP phases of concept formulation, validation, full-scale development, production, deployment and support, the top-level NTIPP requirements presented in this draft Task 2 report are organized around these WSAP phases. Based on the details of top-level and research issue level requirements included in the body of this report, the following are the chief findings resulting from the Task 2 effort.

Early MOTD Decision-Making – System/equipment decisions made in the WSAP concept formulation and validation phases have far-reaching impacts on the MOTD process to follow. Yet, MOTD concerns appear to have little influence during these phases at the present time. Decisions are made in the interests of the hardware system only, and arbitrarily insofar as the MOTD is concerned. As a result, the supportability of the hardware system is left somewhat to chance, with the emerging MOTD definition performed largely by exclusion.

It is recommended that a concerted effort be directed at the inclusion of MOTD concerns in the initial phases of the WSAP, to achieve deliberate compatibility between the MOTD and the hardware system it must support, during the formative stages when such compatibility can easily be attained. Otherwise, it may not be possible to subsequently compensate for inadvertent exclusion of MOTD factors within the system procurement cost and schedule limitations.

ILS/MOTD Interface Definition – The aforementioned problem of MOTD involvement in the early WSAP phases is aggravated by the lack of specific "how-to" instructions for Integrated Logistics Support (ILS) personnel involved in Logistic Support Analyses (LSA) during the WSAP phases. While exhortations abound to accommodate suitable provisions for all support factors, MOTD included, the existing ILS documentation is sadly lacking in details of implementing such provisions (e.g., task analysis, job analysis, and time-phasing of both with respect to MOTD decisions). Without firm guidelines for considering MOTD in the early planning activities, it is unlikely that the present deficiencies can be readily overcome. It is recommended that steps be taken by the Navy to improve and augment the existing ILS governing documents by including specific instructions, guidelines, and steps to be taken to insure that MOTD issues are adequately taken into account during WSAP concept formulation and validation phases.

Qualification Criteria for the ILS Team – Another shortcoming of existing ILS documentation is the absence of criteria for personnel involved in ILS actions which affect MOTD. Often, the ILS planning literature refers to an

"ILS Team," but no definition exists on the composition of this team, nor on the sources from which personnel are to be drawn. Moreover, no requirement is levied that any of the team members possess specific insight and knowledgeability of MOTD. While this need may be filled informally by a diligent, perceptive Program Manager, a clear necessity exists to codify the need for direct, MOTD-related experience factors to be included on the ILS team.

LSA/Training/MOTD Interface Coordination – At present, the conduct of any Head/Data/Training tradeoff study – the cornerstone of the user-data match effort incorporated in NTIPP – would be greatly hampered by the lack of coordinated activity by the LSA personnel, the training community, and those involved with preparation of MOTD. Such a tradeoff must be based upon task analysis, job characteristics, the frequency, criticality, and complexity of maintenance actions, etc. However, the current ILS approach separately places task analysis in the LSA activity, training with the training community, and MOTD in the "technical manual world."

In the NTIPP Task 1 report (CDRL A001), it was noted both in the discussions of the user-data match and the content generation research issues that the training community has insufficient influence on the presentation method, the format, and the content of technical manuals. As a result, it is difficult to assure the effective use of technical manuals for training purposes as well as for maintenance. However, in the light of Task 2 requirements, it is clear that such influence must exist in the early phases of the WSAP, and that coordination must take place not only between the MOTD and training activities but with the LSA activity as well.

The necessary coordination could be implemented in a variety of ways – e.g., mandatory inclusion of a training specialist and an MOTD engineer on the ILS team, or by the requirement to secure inputs to the evolving ILS plans from those areas, etc. It is recommended by the contractor that a suitable means be established for achieving this type of coordination from the inception of ILS planning, so as to provide the framework for an effective Head/Data/Training tradeoff study prior to adoption of constraints which prejudge the outcome of such a study.

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SECTION 1
INTRODUCTION

1.1 OBJECTIVE

The objective of Task 2 is to establish and obtain Navy concurrence for a consistent set of NTIPP requirements which can properly constrain the preliminary baselining in Task 3. These requirements have been derived through the application of engineering judgment to the information base produced in Task 1.

Task 2, Establishment of NTIPP Requirements, is the second effort in the 7-task structure of NTIPP Phase I - Systems and Feasibility Tradeoff Analyses (SFTOA). Task 2 has two distinct objectives:

(a) To establish a consistent set of requirements for NTIPP (both at the top or "system" level and at the research issue level) which fulfills the need for a qualifying control mechanism for Task 3. The nature of the control mechanism is defined by the need to qualify potential alternatives which present themselves in satisfaction of NTIPP functions, i.e., a threshold must be established to test potential alternatives before they are even admitted to consideration. The requirements documented in this report serve this need by imposing a collective constraint on all alternatives synthesized during Task 3 -- a given alternative can be admitted for consideration to the array from which a subsequent selection will be made only if it first satisfies all of the stated Task 2 Requirements.

(b) To obtain Navy review, modification as necessary, and concurrence for these requirements, thereby instituting an agreed-upon basis for proceeding with Task 3 and the balance of the baseline activities. In this light, the requirements documented in this final issue of the Task 2 report are regarded as firm, since Navy review and indicated corrections have now been made.

The source data from which the requirements in the Task 2 report are drawn is the information base produced in Task 1, Analysis of Current and Proposed Technical Manual Systems (CDRL A001). Engineering judgement has been applied to the results of Task 1, resulting in a requirements envelope which retains the presently adequate provisions and proposals for improvement, as well as levying requirements which will compensate for existing gaps in coverage among the current and proposed systems studied.

1.2 PROBLEM STATEMENT AND BACKGROUND

The principal concerns in NTIPP requirements generation are to employ the proper degree of rigor, and to elicit sufficient response and interaction by the Navy to assure concurrence.

Establishing NTIPP requirements for application in Task 3 baseline design is a critical step in the development process. Care must be exercised to avoid the imposition of large numbers of constraints and the danger of limiting the baseline design process severely. The other side of this risk is to postulate broad design requirements resulting in an unmanageable number of alternative approaches. Requirements constraints are subject to the same dangers usually recognized as the "overspecify – underspecify dilemma." Another concern is that one can easily include "requirements" which are really not true requirements or necessarily significant to baseline design.

The generation of appropriate baseline design requirements has been the overriding concern of SFTOA efforts to date. This is the sole design justification for the conduct of Task 1. While the contractor has lent every effort to provide a comprehensive list of requirements it must be recognized that there is no "algebra" (or other logical construct) which can be employed to ensure that a complete set has been generated. In the final analysis, informal judgment is the only source available.

"Ultimately all policies are made and all weapons systems are chosen on the basis of judgments. There is no other way and there never will be. The question is whether those judgments have to be made in the fog of inadequate and inaccurate data, unclear and undefined issues, and a wealth of conflicting personal opinions, or whether they can be made on the basis of adequate, reliable information, relevant experience, and clearly drawn issues."[1] The conduct of Task 1 provided considerable insight to the requirements currently faced by the Navy SYSCOMs in the conduct of their TM business. However, the contractor recognizes that even the most rigorous analysis can overlook points which are evident to those who are responsible for the conduct of Navy MOTD activities on a day-to-day basis. The reader is invited to study these requirements, comment upon their worth, and suggest additions or deletions where appropriate. Constructive criticism will enable the baseline design to proceed with maximum benefit.

[1] English, J. M. (ed.), Cost Effectiveness: The Economic Evaluation of Engineered Systems. John Wiley and Sons, 1968.

1.3 SCOPE AND APPROACH

The scope of Task 2, Establishment of NTIPP Requirements, was bounded by the expenditure of about 20 man-months of effort over a 7-month period. The overall approach was based upon formulating a consistent set of preliminary requirements which were subject to Navy review prior to release.

Schedule and Resources Allocation – The timeframe for the conduct of Task 2 is defined as beginning with the inception of contractual coverage on 24 June 1976, and culminating with the delivery of the Task 2 draft report on 24 January 1977.

Across this timeframe, an incremental staffing plan provided for a research force ranging from 6 to 18 individuals who concurrently performed Tasks 1 and 2. This resulted in the expenditure of approximately 75 man-months of NTIPP effort, of which some 20 man-months are attributable to Task 2. (Not included in these figures is the resource allocation to the NTIPP Fleet Survey of TM Users, which is described in a separate report, the draft issue of which was delivered on 5 March 1977.)

Approach to Requirement Hierarchy – The purpose of a hierarchy of requirements is to allow the designer place proper focus on each individual requirement within the context of its importance to the development of the NTIPP baseline.

NTIPP requirements are inherently groupable into such a hierarchy by noting their relative level with respect to the driving requirements of the Weapon System Acquisition Process (WSAP). Hence, the first-level NTIPP requirements are those which result directly from the driving requirements of the WSAP. These are reactive in nature, and exhibit the highest degree of inflexibility to the design process. The second-level requirements are those which are derived from the first-level, and the process of deriving further-level requirements is continued to a level of convenience. All except the first-level requirements are derived, rather than reactive.

The importance of hierarchical levels of requirements can best be understood by comparing a second-level requirement with a sixth-level requirement. The second-level requirement is a far more important constraint than the sixth-level, and cannot be subjected to the same level of tradeoff freedom as can the sixth-level requirement. What is essentially being considered here is a varying degree of "must-ness" with respect to the requirement levels. The higher levels (first and second) of requirements are generally quite inflexible, while those at the lower levels can be treated in increasingly freer fashion throughout their application to alternate approaches.

1.4 LIMITATIONS

Four types of limitations constrained the Task 2 effort and this report. These involve schedule/cost factors, the preliminary status of requirements that are subject to Navy review, potential impacts of Task 1 report changes, and flexibility in User-Data Match requirements which depend upon an upcoming human factors report.

Limitations Involving Schedule/Cost – Inherent limitations in the scope of Task 2 are offered by the preplanned expenditure of some 20 man-months of effort and appropriate funding across the concurrent Task 1 and Task 2 reporting period of less than 7 months. (The reporting period is defined as commencing with contract award on 24 June 1976 and continuing through 24 January 1977.

User-Data Match Flexibility – A major element in the User-Data Match Research Issue is the human factors study currently in progress by Anacapa Sciences, Inc., of Santa Barbara, California. This firm is operating as Hughes subcontractor for this portion of the NTIPP effort, and – under contractual terms agreed-upon by Hughes and the NTIPP Program Office – will not submit its final human factors study report until 31 March 1977. As a result, the User-Data Match requirements have necessarily been formulated to be sufficiently flexible to fully incorporate the findings of that report.

Firmness of Requirements – The requirements documented in this Task 2 report are regarded as relatively firm, since Navy review has taken place and appropriate additions, deletions, and modifications have been made prior to issue of the Task 2 report in this final form. These agreed-upon requirements will be used to constrain the baseline process in Tasks 3, 4, and 5. However, it is noted that individual requirements given herein are still subject to change, if the need for such change is disclosed during the baseline process, and if such change is determined to be in the best interests of the Navy.

1.5 PLAN OF REPORT

This Task 2 Report, NTIPP CDRL A002, conforms to the requirements of Data Item Description UDI-S-7060. The body of the report is divided into discussions of top-level NTIPP requirements, research issue level NTIPP requirements, and provisions for obtaining Navy review and approval of these requirements.

This document is the second of five end-of-task reports which are governed by the provisions of Data Item Description (DID) UDI-S-7060, dated 1 July 1975, from the David W. Taylor Naval Ship Research and Development Center, Code 186A, Bethesda, Maryland. The above-cited DID specifies the utilization of Sections 1 and 2 as Introduction and Methodology, respectively, and the last two Sections (herein 6 and 7) as Conclusions and Recommendations, respectively. Intervening Sections (herein 3, 4, and 5) are to be utilized for the body of the report. Appendices as needed are permitted by the DID.

Section 2, Methodology, sets forth the relationship of Tasks in the overall NTIPP effort, and describes the constraints bounding NTIPP requirements as well as techniques for synthesizing such requirements.

Section 3 is devoted to the top-level NTIPP requirements, and covers both the rationale and the description thereof. These are the requirements involving NTIPP as a whole, rather than being specifically addressed to a given research issue; the latter type is provided in Section 4, Research Issue Level NTIPP Requirements. Section 5 is dedicated to the suggested provisions for obtaining review and approval of the NTIPP requirements, including treatment of modifications which arise from the review process.

The report contains two appendices. One is a list of references, representing documents specifically used in the Task 2 effort, and the other a glossary of abbreviations and acronyms used in the report.

SECTION 2
METHODOLOGY

2.1 RELATIONSHIP OF TASK 2 TO THE TOTAL NTIPP EFFORT

The purpose of Task 2, Establishment of NTIPP Requirements, is to constrain the synthesis of preliminary alternatives in Task 3 by serving as a threshold which any and all viable alternatives must satisfy as a condition of being accepted for consideration.

Task 2 is the second of seven tasks in NTIPP Phase I – Systems and Feasibility Tradeoff Analyses (SFTOA). The relationship of Task 2 to the other SFTOA Tasks is shown in simplified form in Figure 2-1 on the facing page. The principal input to Task 2 is the information base produced in Task 1, from which a consistent set of preliminary requirements has been developed. These requirements establish the generalized conduct of NTIPP functions in part and in whole, and are based upon rigorous examination of technical manual systems in the U.S. Navy and other organizations. Engineering judgment was applied to the information base of Task 1, both to define areas of existing adequacy and to determine gaps in coverage – i.e., areas not sufficiently accommodated in current and proposed technical manual systems – which should be remedied through the imposition of future requirements.

The requirements set forth herein are the output of Task 2 and represent the control mechanism for assessing the validity of potential alternatives to be synthesized in Task 3. This means that every alternative deemed worthy of consideration in Task 3 must, at a minimum, satisfy the NTIPP requirements documented in this report, thereby assuring that the emerging baseline begins and remains within a suitable envelope of system-level constraints throughout the balance of SFTOA tasks.

Two bounding considerations guided the formulation of this set of NTIPP requirements. First, the requirements must be sufficiently definitive to serve as a reasonable threshold – i.e., they act to reject inadequate or infeasible approaches which might otherwise be embodied in possible alternatives. Second, they must be sufficiently flexible to avoid inadvertently rejecting viable approaches which were not foreseen when the requirements were established. The proper balance between rigor and flexibility is a matter of engineering judgment which was aided by the concurrent conduct of Tasks 1 and 2. NTIPP research personnel preparing the Task 2 requirements are the same individuals who performed the comparative system analysis in Task 1, and who will be responsible for conducting the synthesis and preliminary selection of NTIPP alternatives in Task 3. Hence, continuity is provided between the real-world information base and the requirements and alternatives derived from it.

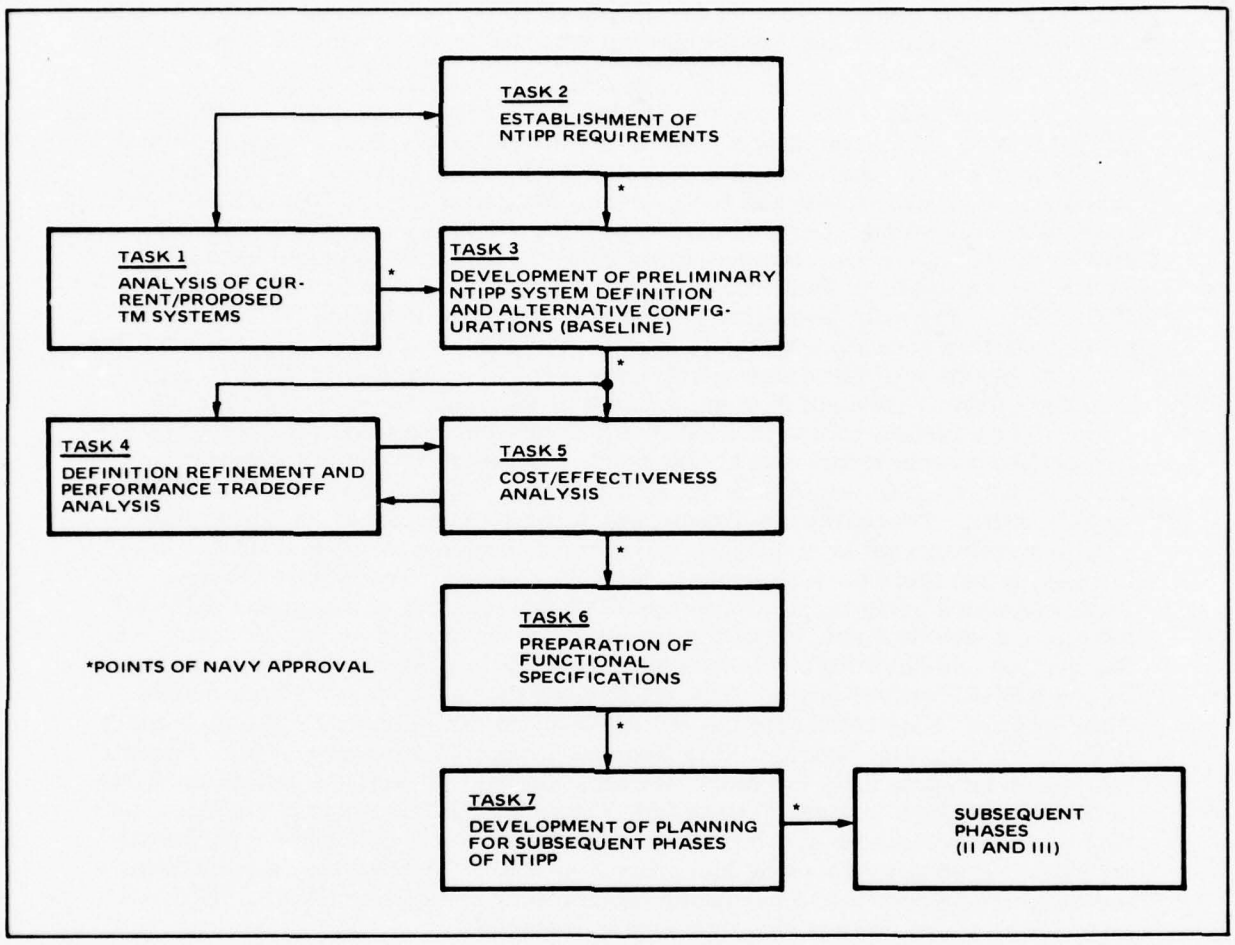

Figure 2-1. Relationship of Task 2 to Overall NTIPP Effort. Results of Task 1 constitute the principal information for conduct of Tasks 2 and 3, with Task 2 results serving as a control mechanism to screen potential alternatives.

2.2 CONSTRAINTS BOUNDING THE ESTABLISHMENT OF PRELIMINARY NTIPP REQUIREMENTS

Examination of the goals of NTIPP, its relationship to the Weapons System Acquisition Process, and the strong "people presence" provide the means of identifying the formation constraints.

Figure 2-2 on the facing page relates two of the primary constraints facing NTIPP. It is recognized that NTIPP is not a weapons system and that, in fact, NTIPP may not be identified as a "system" even in its final form. The need remains, however, to address the problem-set defined by NTIPP in a "systematic and ordered" fashion. One can also recognize the fact that NTIPP must be responsive to the Weapons System Acquisition Process which is characterized by a particular version and application of system engineering principles (see MIL-STD-499A). The only discipline available to ensure a thorough NTIPP design process is that known presently as systems engineering. This is not the military version, but its civilian counterpart; however, the close ties of NTIPP to the military enable ready use of some aspects of weapons systems engineering.

The reactive nature of NTIPP is not only related to the Weapons System Acquisition Process, but also to the user. The user community represents a primary constraint, and this is the sole purpose of the "User-Data Match" research issue. There are other facts which can be considered as constraints to NTIPP requirements in addition to those mentioned above. Consider the need for people and their various roles in NTIPP. When analyzing the research issue structure being employed as the management control to conduct this research and development, all of the issues must consider people. Perhaps the Replication and Distribution issues have the smallest "people" impact; however, no one has discovered how to accomplish even these functions without people. This "people" constraint sets the NTIPP function a considerable distance apart from those normally considered in weapons system engineering, where "people" interfaces are generally far more limited. In point of fact, the output products of NTIPP must be "matched" to certain classes of people (user community) and this transform must be accomplished by people (content generator – technical writers). Human engineering has addressed the "man-machine" interface in the weapons system world in considerable depth, while very little applied research was undertaken in the "man-data" interface.

A formative constraint on NTIPP lies in the content and structure of the engineering data base which is transformed by the content generator into "matched" MOTD. It is logical to postulate that some MOTD influence can be effected on this data base; however, the realities of life strongly suggest that this influence will be minimal. On the whole, the engineering data base is considered a primary constraint in the NTIPP design effort. The final primary constraint on NTIPP design is that the baseline must be constructed such that its structure can be readily accepted by the current Navy TM organizations. In other words, the transition from the "current Navy TM System" to the successful baseline developed by NTIPP should not involve a complex transform. It can be argued that this is part and parcel of the "people" constraint cited earlier, but it is felt that this condition is of sufficient significance that it warrants special consideration as a constraint in its own right.

A number of other conditions could also be considered as constraints – budgets, contractor interfaces, types of manpower levels, etc. The current position is that these conditions (or items) should not be considered as formative constraints in baseline development. The better choice appears to be that these conditions will be most effectively treated in the Performance and Cost Tradeoffs of Tasks 4 and 5 subsequent to the preliminary baseline and alternative design process of Task 3.

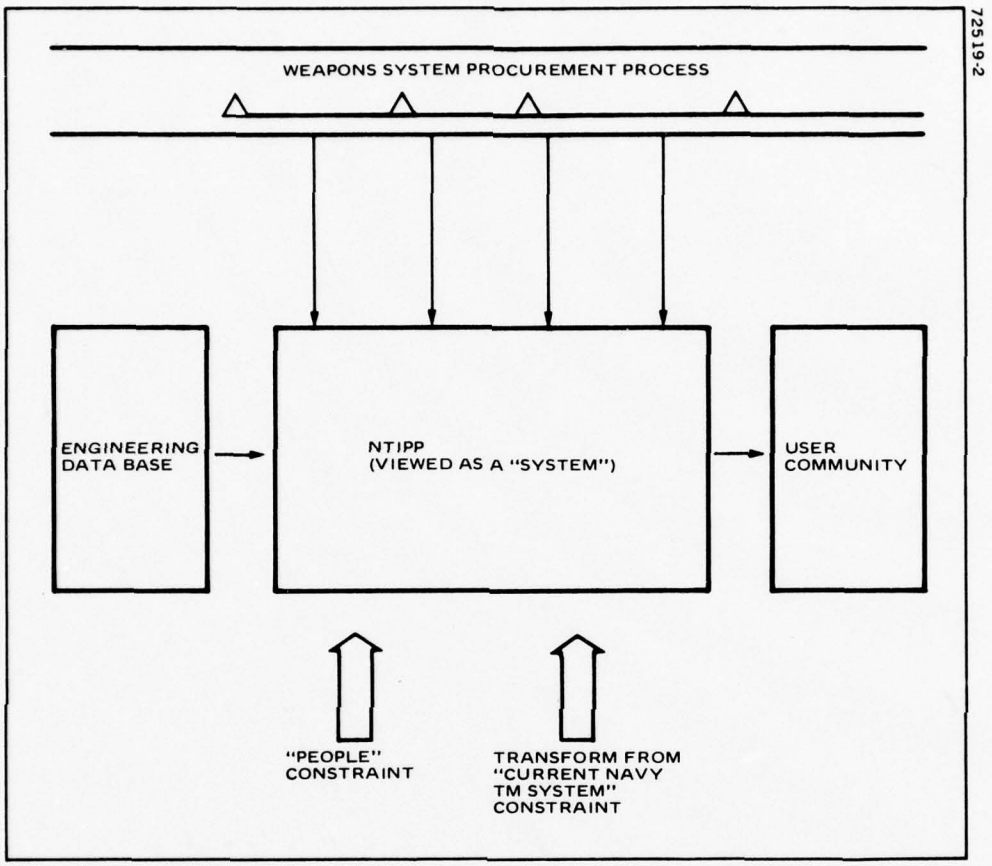

Figure 2-2. Constraints on NTIPP Requirements. Of the five formation constraints that bound the development of NTIPP requirements, the most important are those characterized by "people".

SECTION 3
TOP-LEVEL NTIPP REQUIREMENTS

3.1 RATIONALE FOR THE DEVELOPMENT OF NTIPP REQUIREMENTS IN THE CONCEPT FORMULATION PHASE OF THE WEAPON SYSTEM ACQUISITION PROCESS

NTIPP requirements derived from the Concept Formulation Phase of the Weapon System Acquisition process are the result of reactions to the occurrence of specific events. Reactions to these events, in the form of requirements, concepts and plans, form the basis from which all further MOTD development is initiated.

The Concept Formulation Phase begins with the determination of an operational need or capability. It is typified by the formulation of system hardware design and support concepts which specify alternative approaches to meeting the operational requirements of a proposed system. Figure 3-1 depicts the flow of activity within the Weapon System Acquisition Process (WSAP) during this phase, and notes specific events which this research has found to be critical to the development of MOTD. NTIPP requirements discussed in this topic are generated as a result of activities occurring in these events. For illustrative purposes, Concept Formulation is shown as three distinct flows of activity denoting hardware system-level development, Integrated Logistic Support level development, and MOTD level development. In reality, these flows are intermeshed into a complex of interactive, interdependent activities. Regardless of the manner of illustrating this flow, one point must be made clear: the MOTD acquisition activity is driven by, and dependent on, activities generated at the system design level of the process through ILS. It is not a "stand-alone" activity; it is always reacting to system user needs.

The first event in this phase is the statement of an operational requirement or need. This results in activity at all three levels of the process. The preliminary requirement of system design and support are defined from analysis of the stated operational capability or need. NTIPP requirements resulting from this event are based on the need to define preliminary MOTD.

One may ask why it is necessary to get involved with MOTD at such an early stage of system development. It is at this time that the fundamental questions of proposed system design should be addressed: system complexity, operating environment, user skill requirements, maintenance philosophy, etc. The answer to these and many other such basic questions result in the formulation of preliminary system and support requirements. MOTD requirements must be based on a thorough analysis of proposed system characteristics, not just a simple correlation of current MOTD capabilities to apparent system needs. Such an analysis requires that the various characteristics of the proposed system design be matched to the needs of proposed equipment users and impacted by other related support activities. The place for this User/Data Match to take place is "up-front" in the acquisition process where the greatest impact on overall system and support design can be felt.

The next event in this phase results in the formulation of an MOTD concept. Again, for the purposes of illustration, it has been depicted as beginning the analysis of MOTD capabilities.

Based on the results of the required capability analysis, current technological capabilities are examined to see if they can fulfill the preliminary MOTD requirements. Normally, several approaches are prepared and tradeoffs are conducted to determine which ones fall within acceptable bounds. This set of tradeoffs may involve an advanced development model or models to test the feasibility of proposed approaches, which include technology not currently utilized. The end result is the formulation of an MOTD development concept which reflects those approaches considered feasible for further development. This MOTD concept becomes a part of the ILS concept, which in turn is a part of the

the overall system design concept. It should be evident that the requirements developed "up-front" are now an integral part of the overall system design.

The last event of this phase is the establishment of a MOTD development plan. It is here that schedules are established and coordinated with system development. These schedules, together with the concepts developed in the previous event, become part of the overall systems development plan. Obviously, proper planning of MOTD development is mandatory if user data is to be produced and deployed concurrently with the equipment. The Systems Development Plan is reviewed and subjected to approval by DSARC I before the acquisition process can proceed to the next phase.

The primary intent of the NTIPP requirements established for this phase is to insure that MOTD considerations become an integral part of the early system design process. For that reason, MOTD acquisition activity must be reactive in nature and its detailed operational requirements structured in such a manner as to consider the interactive elements of the proposed system as an integral part of the user data design process.

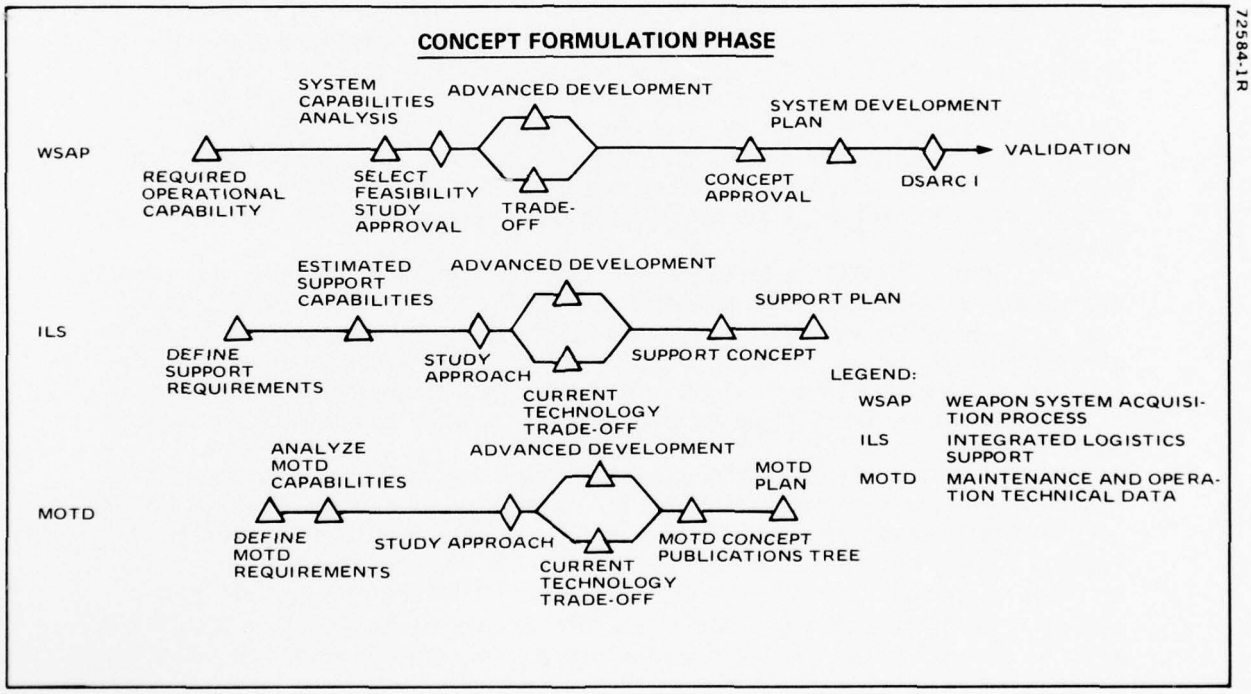

Figure 3-1. Comparison of the Weapon System Acquisition Process and Resultant Actions in the ILS and MOTD Realms. Insufficient Attention is currently paid to defining MOTD factors during the early portion of the Concept Formulation Phase.

3.2 REQUIRED NTIPP ACTIONS DURING WEAPONS SYSTEM CONCEPT FORMULATION

During Concept Formulation, MOTD acquisition must be addressed in a manner analagous to that used for hardware acquisition – a comprehensive systems engineering approach. A MOTD Acquisition Manager's Handbook is needed which details the methodology to be used during the sequence of events leading to the selection of a number of viable MOTD concepts for supporting the proposed system.

The first MOTD-related event during concept formulation is the definition of MOTD requirements with respect to the operational and support capability of the proposed system. Formulation of general MOTD requirements is based upon analysis of the following preliminary data: (1) System complexity to a functional level; (2) System maintainability characteristics such as the existence of built-in test equipment (BITE), automatic test equipment (ATE), and computer diagnostics; (3) User characteristics such as personnel manning levels, skill levels, and skill specialities; (4) Environmental characteristics such as work space, wind, noise, and dirt; (5) Maintenance task characteristics such as type, criticality, complexity, and frequency; (7) Current and proposed MOTD presentation media such as paper, microform, and video disc; (8) Current and proposed MOTD presentation techniques such as JPA, FOMM, and Work Package; (9) Number of systems to be developed, and (10) MOTD interfaces with the training community.

The second MOTD-related event during concept formulation is the establishment of candidate MOTD concepts. The preliminary concepts are detailed in the following manner: (1) Develop publications tree, (2) Perform Head/Data/training Tradeoff, (3) Perform User-Data Match, (4) Define readability/comprehensibility requirements for text and graphics, (5) Define presentation medias (6) Define distribution methodology, (7) Define validation/verification parameters, (8) Define update methodology, and (9) Define feedback origins and methodology.

The third MOTD-related event during concept formulation is the selection of viable MOTD concepts for consideration during the validation phase. Selection of viable alternatives from the various candidate MOTD concepts is accomplished through the performance of gross cost/effectiveness analysis. In this manner, candidate MOTD concepts which are deemed unaffordable, or fall outside the bounds of the existing support capability, are eliminated from further consideration.

The fourth and final MOTD-related event during concept formulation is the development of preliminary plans for implementation of the selected MOTD approaches. These preliminary plans consist of establishing schedules for items such as review of publication planning documents, in-process reviews, draft MOTD completion, validation/verification, final MOTD delivery, and update cycles. The impact of non-compliance with the key elements of the MOTD plan must be defined so the Program Manager can make system tradeoffs effectively.

TABLE 3-I. NTIPP REQUIREMENTS INVOLVING THE CONCEPT FORMULATION PHASE

Reactive Requirements	Derived Requirements
• Define MOTD requirements with respect to the operational and support capability of proposed system	• Formulate general MOTD requirements to support proposed system based on: – System complexity – System maintainability characteristics – User characteristics – Environmental characteristics – Maintenance philosophy – Maintenance task characteristics – MOTD presentation media – MOTD presentation techniques – Number of systems – Training interface
• Establish candidate MOTD concepts derived from analysis of general MOTD requirements	• Formulate MOTD guidance concepts as follows: – Develop publications tree – Perform Head/Data/Training Trade-off – Perform User-Data Match – Define readability/comprehensibility requirements for text and graphics – Define presentation medias – Define distribution methodology – Define validation/verification parameters – Define update methodology – Define feedback origins and methodology
• Select viable MOTD concepts for consideration during validation phase	• Perform gross cost/effectiveness analysis bounded by affordability and capabilities of existing support system – call out applicable specification modules
• Develop planning necessary to implement MOTD concepts for proposed system	• Formulate plan for development and production of MOTD concepts as follows: – Schedule review of publication planning documents – Schedule in-process reviews – Schedule draft MOTD completion – Schedule validation/verification – Schedule final MOTD delivery – Schedule update cycles – Impact of non-compliance

3.3 RATIONALE FOR DEVELOPMENT OF NTIPP REQUIREMENTS IN THE VALIDATION PHASE OF THE WEAPON SYSTEM ACQUISITION PROCESS

The primary objective of the Validation Phase is to select a design and support approach for development of a proposed system through study, analysis, and tradeoff. NTIPP requirements established for this phase provide guidelines for development of specific MOTD requirements, and formulation of criteria for assessment of contractor proposal and responses.

The second phase of the Weapon System Acquisition Process is Validation. Concepts and plans developed in the previous phase are validated and refined through extensive study, analysis, development and prototype testing. The primary objective is to select, from the group of alternatives developed in the Concept Formulation Phase, one approach which meets the overall system design requirements while maintaining cost as an equal parameter with performance and schedule. NTIPP requirements are derived from an inherent need to react to the Weapon System Acquisition Process. The flow of activity within this process is depicted in Figure 3-2. For the purpose of this discussion, it has been shown as occurring on three distinct levels: system design/development, Integrated Logistic Support development, and Maintenance and Operation Technical Data development, with specific events occurring phased sequence between them. In reality, this activity is a complex of intermeshed, interdependent actions with events overlapping each other. The events noted here are not to be considered as all of those which take place, or are likely to take place, but only those which this research has found to be most critical.

The Validation Phase begins with the approval of the systems development plan established in Concept Formulation. This approval initiates activity at the system development level to establish design and support requirements from the basic concepts developed in the previous phase. Such activity at the systems level requires a reaction at the MOTD development level. As such, NTIPP begins the development of MOTD requirements. These requirements define parameters and specifications to be used for further development of the MOTD concept established in Concept Formulation. Included in these would be preliminary technical requirements by type and location, specifications for use of existing data, specification for development of new data, constraints upon development and use of data, and program milestones. But to achieve any appreciable level of confidence in these requirements, the publications tree, head/data/training tradeoff/user-data match, validation/verification parameters, etc., must be validated against the latest system design information available. In this way any design changes or improvements incorporated after the establishment of the basic system support concept will be taken into account when MOTD requirements are developed.

As these requirements normally become part of the input to an RFP, some criteria for evaluating a contractor's response to them must also be established. These criteria are utilized to assess the contractor's logic for use of an existing presentation technique or development of new ones, and the validity of his costs and proposed methods for demonstrating the use of MOTD to support operations, training, and maintenance. It is also at this time that the method of proposal approach is established. The selection of an approach is dependent upon whether the MOTD requirements can be addressed adequately by the normal "paper competition" methods of response, i.e., written proposals with appropriate backup, or whether they must be addressed through an actual demonstration of a design concept, such as prototype. The primary reason for including criteria as a requirement of NTIPP is to assure that a means is developed

which aids in the determination of the feasibility of new concepts or techniques, and can point out potential problem areas before they become so severe as to cause significant modification of requirements later in MOTD acquisition.

For the purpose of this discussion, it can now be assumed that an RFP has been released and responses have been received. Perhaps the most important event of this phase now takes place. Contractor responses are analyzed and tradeoff evaluations made against the previously established criteria for selection of an approach which best meets the requirements of MOTD development and system support. Again, the various elements of MOTD development are addressed: publication tree coverage, validation/verification plans, compliance with user-data match parameters, cost estimations, criteria management, planning and control, etc. Obviously, NTIPP requirements for this trade-off are a restatement of the assessment criteria with emphasis placed on "the degree" to which a particular approach satisfies the MOTD requirements. As decisions are reached regarding these trade-offs, they become a part of the overall system design and support approach which is then subjected to review and approval by DSARC II, before proceeding to the next phase.

The basic approach behind the establishment of NTIPP requirements during the Validation Phase is to assure that MOTD concepts developed in the previous phase are reactive to the dynamic nature of the Weapon System Acquisition Process. The developmental process of system design demands changes in concept; hence, NTIPP must have the capacity to continually reassess its development approach and design efforts. The establishment of MOTD requirements and assessment criteria to a detail level leads to better trade-off and assessment techniques.

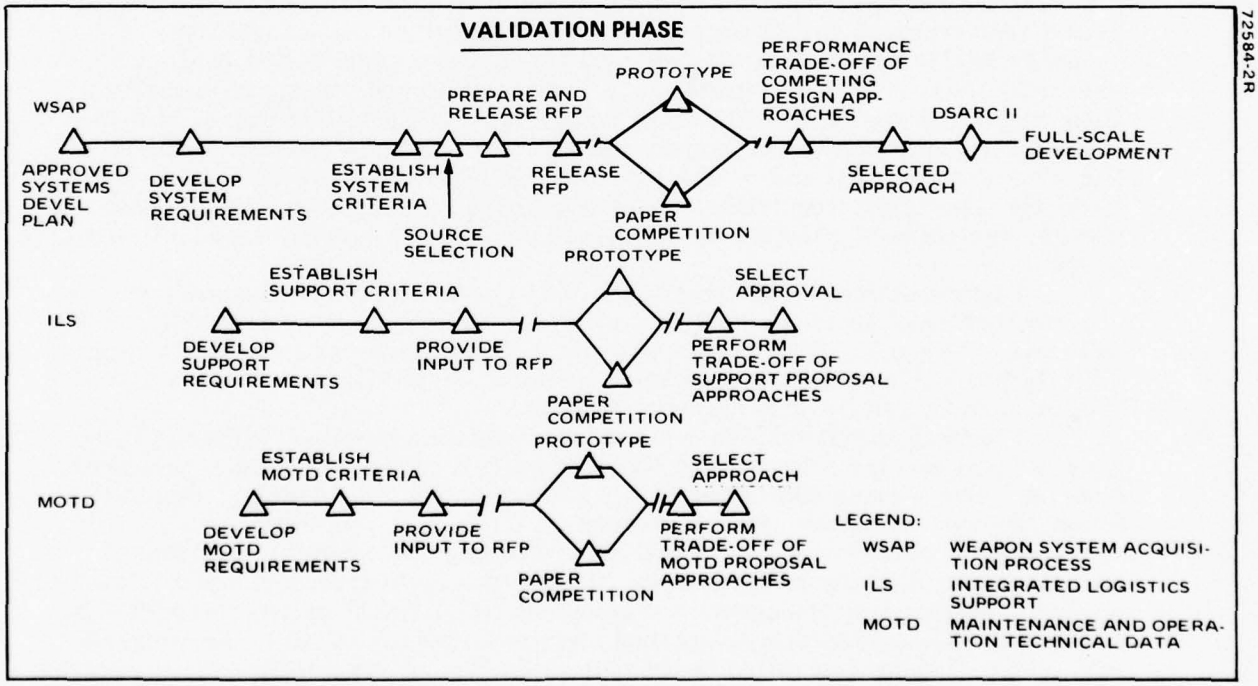

Figure 3-2. Relationship of MOTD Events to WSAP Actions in the Validation Phase. Detailed planning is required to establish MOTD requirements in sufficient depth to support MOTD procurements from contractors.

3.4 REQUIRED NTIPP ACTIONS DURING WEAPONS SYSTEM VALIDATION PHASE

The purposes of validation are to verify preliminary MOTD design concepts, accomplish necessary planning, resolve or minimize developmental risks identified during concept formulation, and prepare the formal requirement documents that are the basis for full-scale development.

The initial MOTD-related event during validation is the development of formal MOTD requirements which meet the proposed system support concept (see Table 3-II). To establish specific MOTD development requirements for support of the proposed system, the preliminary data used to formulate the general MOTD requirements must be validated. This data which was analyzed in concept formulation is detailed in Topic 3.2. Based upon changes in items such as system hardware and maintainability characteristics uncovered during this data validation, the MOTD guidance concepts are modified and finalized. These guidance concepts, which were established during concept formulation, are also discussed in Topic 3.2. The final task to be performed during this event is the selection of a family of specifications which are compatible with the MOTD requirements.

The next MOTD-related event during validation is the establishment of criteria for assessing compliance with MOTD development requirements. To define criteria for evaluation of proposed approaches with respect to meeting MOTD requirements, the following steps must be taken: (1) Assess risks, (2) Establish risk boundaries, (3) Establish MOTD test parameters, (4) Establish validation/verification parameters, and (5) Prepare MOTD input to the RFP.

Risk assessment is the subjective determination that a specific performance, schedule, or cost objective will or will not be attained with the planned course of action. Risk analysis and the establishment of acceptable risk boundaries are necessary for determining the reasonableness and acceptability of proposed MOTD approaches. During Validation, the elements of risk which constitute the most critical uncertainties in Full-Scale Development are identified. Many factors impacting MOTD performance, cost, and schedule cannot be forecast with adequate confidence merely through paper designs and analytical studies. For example, the ability of a particular MOTD concept to meet hardware mean-time-to-repair requirements and data access time requirements is seldom, if ever, certain until after the hardware and MOTD have actually been built and tested.

Test parameters must be established to evaluate MOTD adherence to requirements such as those related to user-data match, training and maintenance philosophy. Finally, the MOTD input to the RFP is prepared, detailing the specific MOTD development requirements, the finalized MOTD guidance concepts and the selected family of MOTD specifications.

The final MOTD-related event during validation is the evaluation of proposed approaches for adherence to MOTD requirements based on the established criteria. The various contractor MOTD proposals are traded off based upon the following considerations: (1) Publications tree coverage, (2) Validation/verification plan coverage, (3) Compliance with user-data match, training, and maintenance philosophy requirements, (4) Recognition of impact of other related support elements, (5) Management risks, (6) Cost, (7) Cost control, and (8) Cost collection. Recommendations are then prepared, and submitted to the Program Acquisition Management office for consideration during the contract award process.

TABLE 3-II. REQUIREMENTS INVOLVING THE VALIDATION PHASE

Reactive Requirements	Derived Requirements
• Develop formal MOTD requirements which meet proposed system support concept	• Establish specific MOTD development requirements for support of proposed system as follows: – Validate preliminary data used to formulate general MOTD requirements – Finalize MOTD guidance concepts – Select family of MOTD specifications
• Establish criteria for assessing compliance with MOTD development requirements	• Define criteria for evaluation of proposed approaches with respect to meeting MOTD requirements as follows: – Assess risks – Establish risk boundaries – Establish MOTD test parameters – Establish validation/verification parameters – Prepare MOTD input to RFP
• Evaluate proposed approaches for adherence to MOTD requirements based on established criteria	• Perform trade-off analysis of MOTD proposals based on: – Publications tree coverage – Validation/Verification plan coverage – Compliance with User-Data Match, training, and maintenance philosophy requirements – Recognition of impact of other related support elements – Management risks – Cost – Cost control – Cost collection

3.5 RATIONALE FOR THE DEVELOPMENT OF NTIPP REQUIREMENTS IN THE THE FULL-SCALE DEVELOPMENT PHASE OF THE WEAPON SYSTEM ACQUISITION PROCESS

During the Full-Scale Development Phase of the Weapon System Acquisition Process, the system (including its supporting elements) are fabricated and tested. NTIPP requirements resulting from this phase are essentially those which serve to insure that MOTD is produced according to predefined concepts and plans.

The Full-Scale Development Phase of the Weapon System Acquisition Process begins with the approval of a design approach and award of a development contract. It is during this phase that the system, including all of its supporting elements, is designed, fabricated, and tested. The intended output is, as a minimum, a preproduction system which closely approximates the final product, the documentation necessary to enter the production phase, and test results which meet the system design and support requirements. Figure 3-3 depicts the flow of activity during full-scale development, with specific events noted which this research has found to be critical to the process of acquiring MOTD. As stated previously in Topics 3.1 and 3.3, this flow has been shown as three separate activities for illustrative purposes only.

The first event to occur which is of significance to the establishment of NTIPP requirements is the preparation of a detail plan by a selected contractor for development of preliminary MOTD. This requires the establishment of an interface with the contractor, to review and assess his plans for compliance with the stated design and development MOTD approach. Such review and assessment activity at this point requires that a determination be made of the inherent risks in a contractor's plans and schedules, his ability to maintain costs within established bounds, the completeness of his publications tree coverage, his compliance with established user-data match criteria, consideration of other related support activities such as training, spares, maintenance, etc., in his plans, validation/verification considerations, and planned activity for updating MOTD as a result of design change. By assuring that a contractor's preliminary MOTD development plans accurately reflect the design concept, errors which could result in costly subsequent change can be corrected before they become a major problem.

At this juncture, the contractor will begin preparation of the preliminary MOTD. NTIPP requirements during this event will concern the conduct of in-process reviews, to assure compliance with established plans and schedules and to assess the compatibility of what is being produced with respect to the evolving system design and support concept. The specific requirements of an in-process review concern the assessment of such items as variance from established plans and schedules, risks incurred and anticipated, costs incurred and projected, actual impact of other related support activities on the MOTD being produced, and actual compliance with user/data match criteria. The rationale for establishment of these requirements as part of an in-process review activity is to assure that MOTD preparation is proceeding according to plan.

The last event of this phase is to receive the preliminary MOTD and verify its suitability. It must be prepared in accordance with the approved plans and provide for validation during system and support demonstration. NTIPP requirements must confirm that the MOTD format and content matches the current design configuration and satisfies support requirements and goals established in previous analysis. Compatibility of MOTD with equipment configuration is a prerequisite to establishment of a product baseline and approval to proceed to the next phase.

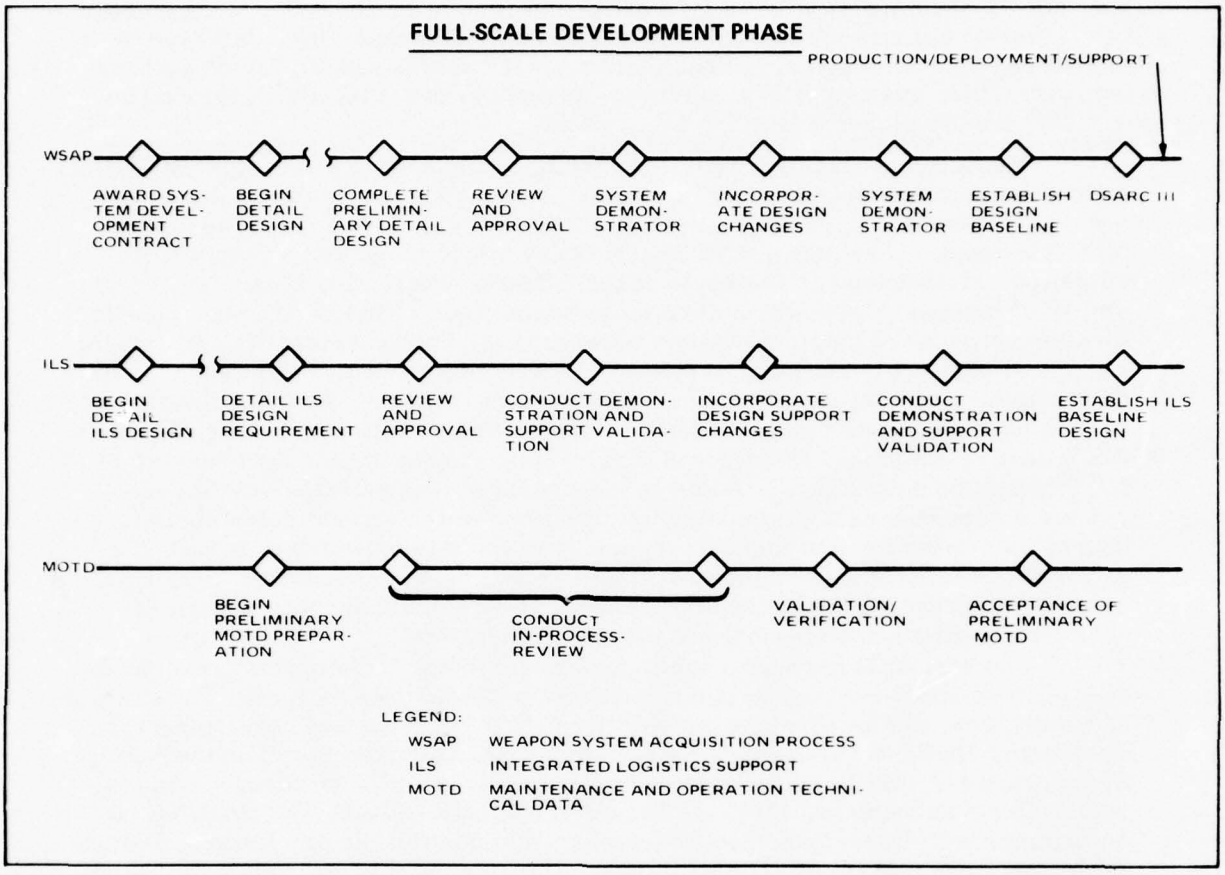

Figure 3-3. Relationship of MOTD to Systems Development in the Full-Scale Development Phase of the WSAP. NTIPP requirements developed for this phase are designed to insure that preliminary MOTD is developed and produced in accordance with established concepts.

3.6 REQUIRED NTIPP ACTIONS DURING WEAPON SYSTEM FULL-SCALE *DEVELOPMENT*

During Full-Scale Development, a continuous interaction exists between contractor and government personnel responsible for MOTD development. This interaction is accomplished through logistic and publication review teams which provide guidance to the contractor, and assist in resolving problems so that a totally integrated support package is developed according to schedule.

The initial MOTD-related event during the Full-Scale Development Phase occurs immediately after contract award. An interface is established with the selected contractor to provide guidance and insure compliance with the stated MOTD concept. The contractors MOTD development plans and schedules are reviewed and assessed on the basis of the following characteristics: (1) Acceptability of inherent risks, (2) Ability to maintain costs within established bounds, (3) Completeness of publication-tree coverage, (4) Ability to identify and develop additional equipment manuals as needed, (5) Compliance with established user-data match, training, and maintenance philosophy criteria, (6) Consideration of impact of other support activities, and (7) Validation/verification considerations. Additionally, guidelines for desired flexibility in the design and development of MOTD must be established. As program-unique characteristics create previously unforeseen data communication problems which are not solvable using conventional presentation techniques, the contractor is expected to devise alternative MOTD approaches which address these problems. Procedures must be defined for contractor submission of innovative MOTD concepts to cognizant government program personnel for review and approval.

The next MOTD-related event during Full-Scale Development is the conduct of in-process reviews to insure contractor compliance with established plans and schedules, and to assess compatibility with overall system development. Contractor MOTD development progress to date is reviewed based on the following parameters: (1) Variance from established plans and schedules, (2) Risks incurred and anticipated, (3) Costs incurred and anticipated, (4) Actual MOTD compliance with User-Data Match, training, and maintenance philosophy criteria, (5) Actual impact of other related support elements on MOTD development, and (6) Acceptability of cost and schedule reporting. A prime objective of the in-process reviews is to identify inadequacies in the MOTD being developed by the contractor, and implement corrective measures before the product is complete and all funds have been expended.

The final MOTD-related event during Full-Scale Development is a review of completed preliminary MOTD to verify compliance with requirements. The preliminary MOTD is assessed with respect to the following criteria: (1) Compliance with stated requirements, (2) Variance of risks from prescribed bounds, (3) Cost variance, (4) Schedule variance, (5) Variance from user-data match, training, and maintenance philosophy criteria, (6) Variance from planned impact of other related suggested activities, (7) Compliance with validation/verification criteria, and (8) Plans and schedules for user feedback and update. A critical aspect of this review is to determine the adequacy of the plans and schedules for updating the MOTD. Deficiencies which are attributable either to hardware modifications or to user comments must be corrected in a timely manner, or MOTD field effectiveness is significantly decreased.

TABLE 3-III. REQUIREMENTS INVOLVING THE FULL-SCALE DEVELOPMENT PHASE

Reactive Requirements	Derived Requirements
• Establish interface with selected contractor to provide guidance and insure compliance with stated MOTD concept	• Review and assess contractor plans and schedules for the following: – Inherent risk in plans and schedules – Maintaining costs within established bounds – Completeness of publications tree coverage – Identification and development of additional equipment manuals – Compliance with established User-Data Match, training, maintenance philosophy criteria – Consideration of impact of other related support activities – Validation/verification considerations
• Conduct in-process reviews to insure contractor compliance with established plans and schedules, and to assess compatibility with overall system development	• Review and assess the following: – Variance from established plans and schedules – Risks incurred and anticipated – *Costs incurred and anticipated* – Actual compliance with User-Data Match, training, and maintenance philosophy criteria – Actual impact of other related support elements on MOTD development – Cost and schedule reporting
• Review preliminary MOTD and verify compliance with requirements	• Assess preliminary MOTD with respect to the following: – Compliance with stated requirements – Variance of risks from prescribed bounds – Cost variance – Schedule variance – Variance from User-Data Match, training, and maintenance philosophy criteria – Variance from planned impact of other related support activities – Compliance with validation/verification criteria – Plans and schedules for user feedback and update

3.7 RATIONALE FOR THE DEVELOPMENT OF NTIPP REQUIREMENTS IN THE PRODUCTION/DEPLOYMENT/SUPPORT PHASES OF THE WEAPON SYSTEM ACQUISITION PROCESS

NTIPP requirements generated from the Production/Deployment and Support phases of the Weapon System Acquisition Process result from the need to monitor, coordinate, and assess the development of final MOTD.

Production, Deployment and Support are the final phases in the Weapon System Acquisition Process. It is during these phases that the system, including its training equipment, spares, facilities, maintenance and operator technical data, etc., are produced for operational use. The primary objective is to deliver to the operational unit(s) an effective, supportable system at an optimum cost. NTIPP requirements resulting from these phases are normally directed toward monitoring, controlling, and assessing the production, deployment and support of MOTD against concepts, plans, and criteria developed in the previous phases. As in topics 3.1, 3.3, and 3.5, the flow of activity within these phases of the Weapon System Acquisition Process is illustrated in Figure 3-4 as occurring at three separate levels.

Production begins with the order to procure formal technical documentation. This order is based on the proposed product baseline established during the previous phase of the acquisition process and approval to award support resources contracts. NTIPP requirements resulting from this activity center on assuring that the plans and schedules for procurement of formal MOTD accurately reflect the production baseline design and support critieria. Significant elements of this requirement are acceptability of anticipated risk, completeness of publications tree coverage, compliance with user/data match, training and maintenance philosophy criteria, and considerations for validation/verification. This type of assessment is made before production is initiated, during production in the form of in-process reviews, and at the completion of production when the suitability of the delivered MOTD is verified against the system design and support criteria. This final verification assures that the technical data has been updated to agree with the final requirements specification resulting from first article inspection and evaluation. It must also demonstrate that the MOTD to be deployed will satisfactorily provide personnel with the information necessary to conduct operation and maintenance in support of established performance goals. The goal of this verification and demonstration is to test the technical data for handling durability, accuracy and completeness of information, clarity appropriate for use at the intended skill levels, ease of access and updating.

Accepted, final MOTD is replicated and distributed to fleet user activities in accordance with equipment deployment schedules, training activities in accordance with training schedules, and cognizant support and administrative storage activities. NTIPP requirements resulting from this activity are to assure that the data is replicated in accordance with user/data match criteria and that distribution requirements are met. On receipt of MOTD, each operational and training activity will conduct preliminary reviews to identify deficiencies. NTIPP will coordinate and initiate change proposal to update deployed data and assure changes are distributed to using activities. In addition, NTIPP will act as the focal point for collection of user feedback and initiation of MOTD update throughout the operational life of the system.

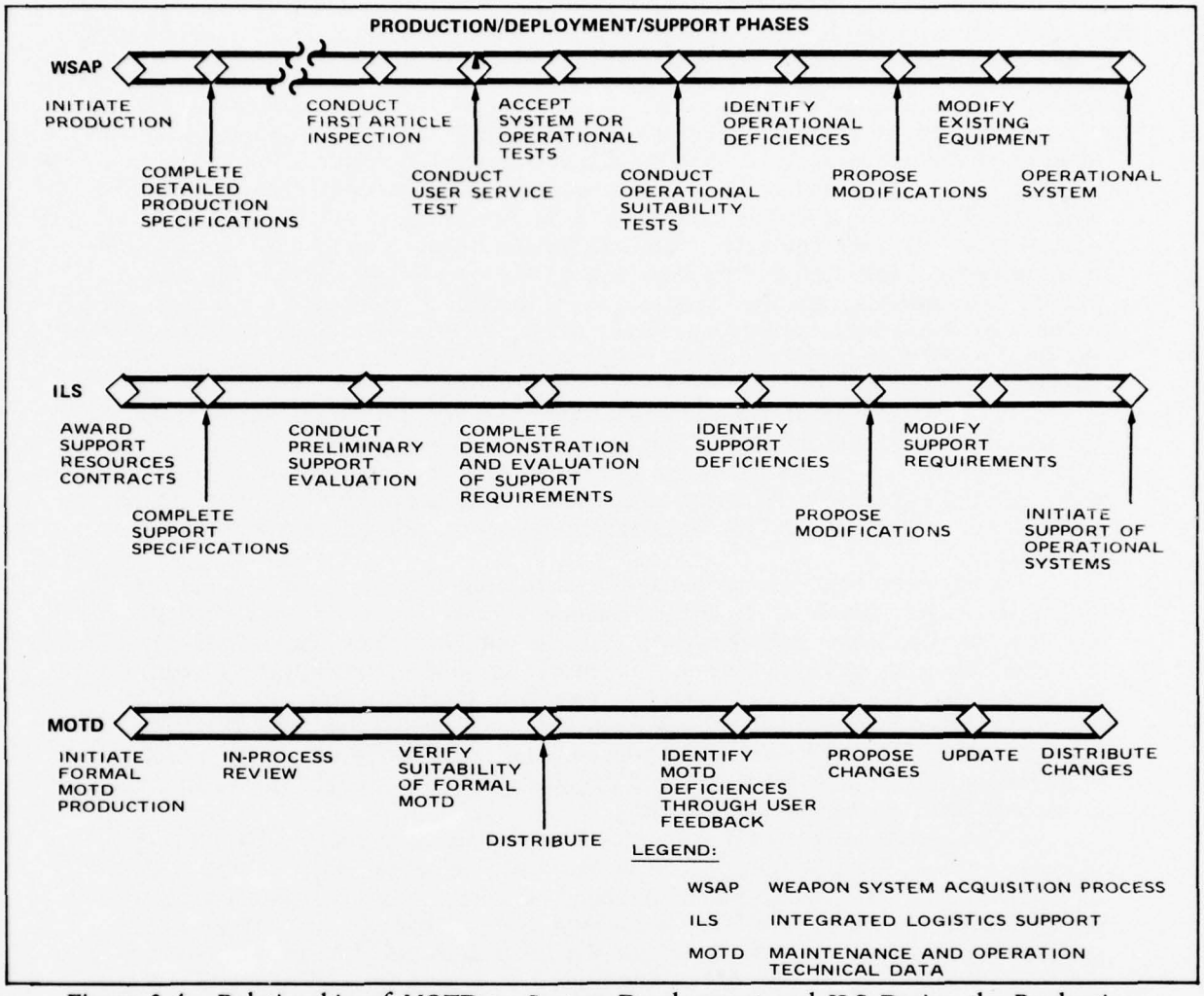

Figure 3-4. Relationship of MOTD to System Development and ILS During the Production, Deployment, and Support Phases of the Weapon System Acquisition Process.

3.8 REQUIRED NTIPP ACTIONS DURING WEAPON SYSTEM PRODUCTION/ DEPLOYMENT/SUPPORT PHASES

During the Production/Deployment/Support Phase, the final MOTD product is developed and deployed for operational use. Consequently, replication, distribution, feedback, and update become the most critical elements of the MOTD acquisition process.

The first three MOTD-related events during the Production/Deployment/ Support phase are as follows: (1) Establish plans and schedules for production of final MOTD, (2) Conduct in-process reviews to insure contractor compliance with established plans and schedules, and (3) Review final MOTD and verify compliance with requirements. The interaction between contractor and government personnel initiated during Full-Scale Development is continued in this phase. The military agency logistic and publication review teams monitor contractor operations, provide guidance during MOTD development, and review the final product in much the same manner as described in Topic 3.6 for preliminary MOTD.

The fourth MOTD-related event during Production/Deployment/Support is replication and distribution. The final MOTD is replicated in required quantities and distributed to the following activities: (1) Training activities in accordance with training schedules, (2) Fleet user activities in accordance with equipment deployment schedules, and (3) Cognizant support and administrative activities for storage.

A primary replication concern is media selection. Since several potential media exist, which likely will be narrowed down to one or two as NTIPP evolves, the functional requirements will also narrow. However, even if a new medium such as video disc is determined to be the most effective, with the protracted time (a minimum of five years) to make the transition, conventionally printed manuals and microforms must still be supported in the early 1980's. Therefore, the narrowing process and transition dictates the requirement to continue to provide functional capability for the present media (printed books and microforms) in the interim.

The requirements of distribution are primarily to deliver MOTD to the using activities utilizing the most efficient, cost-effective methods and maintain an up-to-date MOTD configuration index of all users. The ultimate goal is to provide a distribution system and a storage system that will be centrally controlled with storage facilities strategically situated to provide rapid delivery and easy availability to the user. The distribution system will evaluate the quantity and type of MOTD required by the user, deliver the MOTD at the desired time, and establish controls on distribution from a continuing system evaluation.

The fifth MOTD-related event during the Production/Deployment/Support phase is the establishment of feedback channels for monitoring MOTD user complaints and the initiation of the MOTD update cycle. Implementation of the user feedback and update cycles must include: (1) Evaluation of MOTD effectiveness from a User-Data Match and training viewpoint, (2) Evaluation of quality control effectiveness, and (3) Assessment of required corrective actions.

The objective of the feedback system is to provide the means for the user of MOTD to report discrepancies, and for the mechanisms to be provided so that the reported information can be acted upon (MOTD update). The update cycle must include a viable, continuing configuration control function. The configuration control function would provide a list of the equipment for which each user is responsible, the current change status of each equipment, and the inventory of the TMs the user is maintaining.

TABLE 3-IV. REQUIREMENTS INVOLVING PRODUCTION/ DEPLOYMENT/SUPPORT PHASES

Reactive Requirements	Derived Requirements
• Establish plans and schedules for production of final MOTD	• Review and assess contractor plans and schedules for the following: – Risk acceptability – Cost bounds and acceptable variables – Completeness of publications tree coverage – Compliance with established User-Data Match, training, and maintenance philosophy criteria – Consideration of impact of other related support activities – Validation/Verification considerations
• Conduct in-process reviews to insure contractor compliance with established plans and schedules	• Review and assess final MOTD preparation with respect to the following: – Risk management – Cost management – Compare MOTD completed to date with finalized publication tree – Variance from User-Data Match, training, and maintenance philosophy criteria – Variance from planned impact of other related support elements – *Validation/verification status*
• Review final MOTD and verify compliance with requirements	• Assess final MOTD with respect to deviation from plan as follows: – Risk variance – Cost variance – Variations from final publications tree – Variance from User-Data Match, training, and maintenance philosophy criteria – Variance from planned impact of other related support elements
• Replicate and distribute final MOTD to using activities	• Implement plans for final MOTD replication and distribution as follows: – Training activities in accordance with training schedules – Fleet user activities in accordance with equipment deployment schedule – Cognizant support and administrative activities storage
• Establish feedback channels for monitoring MOTD user complaints a and initiate update cycle	• Implement user feedback and MOTD update cycle – Evaluate effectiveness from User-Data Match and training viewpoints – Evaluate quality control effectiveness – Assess required corrective actions

SECTION 4
RESEARCH ISSUE LEVEL NTIPP REQUIREMENTS

4.1 USER-DATA MATCH REQUIREMENTS

Requirements for the User-Data Match will impact, directly or indirectly, many NTIPP issues. Acquisition, content generation, and the head/data/training trade-off will be among the areas of highest impact, resulting from the successful application of the User-Data Match model to the design and development of MOTD.

The goal of the User-Data Match is to assure that technical documentation meets all the user's data needs and requirements. By meeting these needs and requirements, major MOTD defects will be eliminated, thus improving MOTD usability and credibility. It is anticipated that improved MOTD usability and credibility will increase Fleet operational readiness and decrease equipment/system support life cycle costs. At this time it is impossible to quantify exact cost savings or precisely measure the amount of increased Fleet operational readiness, because data in these areas either does not exist and cannot be determined without inferential analysis, or is not readily available. Therefore, until such time as such data do exists in usable form, only qualifiable assumptions based on the evidence at hand can be made.

The user-data match research issue will result in a methodology or model and set of guidelines for the development of MOTD in its most useful form based on an effective balance among the various combinations of user personnel characteristics; job tasks as dictated by the equipment/systems worked on; environmental conditions; training considerations; maintenance philosophy; and appropriate formats and media techniques for the presentation of MOTD. This "model" will not only be developed, but specific methods of applying it will be included. The model and accompanying guidelines will provide the framework for making the necessary decisions involved with the design and development of an MOTD package, and will provide the theoretically best balance among all the variables. Additionally, since most MOTD is developed with numerous constraints already imposed upon the developer, the methodology will also enable reasonable, justifiable decisions to be made in light of the imposed constraints.

User-Data Match requirements generally address problem areas identified during the analysis of current and proposed TM systems. These problem areas include the overwhelming lack of human factors considerations found in most current and proposed acquisition specifications, policies, and procedures; the cursory awareness paid to the user's data needs by the content generator; non-implementation of existing human engineering principles presently found in Logistic Support Analyses; and the paramount need for a Head/Data/Training Trade-Off which will determine how the user is to acquire the necessary data and skill he needs to successfully operate/maintain the equipment he must support.

In addressing the problem of the lack of human factors considerations found in current and proposed acquisition policies and procedures, it becomes evident that the User-Data Match must specify what human factors considerations should be incorporated into the acquisition specifications, etc. These User-Data Match acquisition requirements will specify the manner in which the content generator must develop his MOTD product from a human engineering standpoint, and specify the information the content generator must know in order to produce optimal MOTD, matched as effectively as possible to the user. In order to achieve this match, the following User-Data Match component information requirements must be fulfilled:

Personnel Characteristics – The user personnel characteristics which must be identified and taken into consideration are Basic Test Battery scores

4.1 USER-DATA MATCH REQUIREMENTS (Continued)

which indicate arithmetic reasoning (ARI), mechanical comprehension (MECH), and basic intellectual ability (GCT); Navy rate, rating, or specialty within rating; reading/comprehension ability; years of related on-the-job experience; formal education; Navy schooling; etc. (With regard to Navy schooling, it is important to note that elemental maintenance philosophy differences exist. NAVAIR schooling is generally based on "black-box" replacement, whereas NAVSEA and NAVELEX schooling is based on "repair-in-place" philosophy.)

Equipment/Systems and Task Analysis – Another information requirement is a detailed analysis of the equipment/systems the technician works on. This analysis should include a comprehensive description of the equipment/system; a complete functional job task analysis of the duties the technician must perform with respect to the equipment/systems; and a definition of the maintenance philosophy imposed on that system. This definition should encompass such things as level of fault isolation; mean time to repair the equipment/systems failures; existence of Built-In Test Equipment, Automated Test Equipment, or computer diagnostics; and the need for manual troubleshooting.

Environmental Constraints – Environmental variables which may impact the technician's ability to use and comprehend the MOTD must be designated. These environmental information requirements include such items as illumination, wind, noise dust, dampness, workspace restrictions, etc.

Presentation Techniques – Of major importance in achieving an effective user-data match are the information requirements which relate to presentation techniques. These techniques, which are employed to present the MOTD to the user, fall into two categories – formats and components of formats (such as JPA, FOMM, hybrid, etc.), and media (paper manual, microform, video disc, etc.) Information concerning these techniques must relate to their appropriateness and the effectiveness with which they present specified types of data to specified users according to the methodology of the user-data match. Essentially, what is required for each technique is an evaluation of its effectiveness of communication within certain parameters (as specified by the procuring agency).

Very little attention appears to be paid by the content generator to human factors considerations during the design and development of MOTD. Following the data acquisition rules, policies, and procedures, the content generator performs the human transformation of engineering/manufacturing/maintenance data into MOTD. As a consequence of human involvement, the transformation output is often subject to interpretations, biases, inadequacies, and errors. Therefore, it is imperative that the data acquisition rules, policies and procedures provide explicit guidelines for use of the user-data match model or methodology by the content generator. Also, it is important that the content generator get instructions or guidelines for conducting the Head/Data/Training Trade-Off and Readibility/Comprehensibility guides for text and, if possible, graphics.

Under the current system of MOTD development, some level of Logistics Support Analysis is usually conducted. (This type of analysis will probably continue to be a part of future MOTD development systems also.) The LSA typically provides guidelines for the matching of MOTD to its users. However, these guidelines are usually vague and often are not implemented.

Theoretically, the LSA could provide much of the data necessary to fulfill the User-Data Match Component Information Requirements. The LSA spec MIL-STD-1388 (used by all services) indicates that requirements such as maintenance support concept equipment/systems components including support and test equipment, technical data, facilities, personnel and training requirements, environmental constraints, etc., be specified for each equipment system. However, this specification is not nearly detailed or comprehensive enough for User-Data Match purposes; additionally, the methods of application are never formally addressed. LSA specification requirements must be specific enough so that fulfilling the User-Data Match component information requirements can be readily performed by the Content Generator at a reasonable cost.

Various requirements with regard to training must be met if the MOTD is to effectively match the user's needs. The Head/Data/Training Trade-Off is the process by which these requirements can be fulfilled. During this trade-off, the critical decisions are made concerning how the user is to acquire the necessary data and skills to satisfactorily operate/maintain the equipment/systems he must support. As part of the trade-off, information must be gathered and assessed regarding each component of the trade-off: The "Head," the "Data," and the "Training." Information requirements with respect to the "Head" are items such as the amount of formal education the user has already obtained, the user's prior job experience, Navy schooling or training completed, general capabilities, as indicated by the ARI, MECH, and GTC scores, etc.

With regard to the "Data," the total data content needed to support the equipment/systems must be assessed. This includes task data used during job performance and system descriptions used prior to job performance. Also, the manner in which all or parts of this data can best be transformed into useful MOTD must be specified in terms of format and media techniques. It is recognized that very limited human factors research exists in the Head/Data interface area. For this reason, it is the obligation of NTIPP to accomplish this research for this specific application. For example, which components of presentation techniques are best suited for portraying MOTD for the performance of specific kinds of job tasks? Obviously, most of these "Head/Data" information requirements are highly similar, if not identical, to the User-Data Match component information requirements. Therefore, to fulfill both sets of requirements it would only be necessary to gather and assess this information once.

However, in addition to the "Head" and "Data" Information Requirements there are "Training" requirements which must be addressed. These include making a determination of what portion of the data content could the user best acquire by formal training, and what portion by MOTD, taking costs various types of training and various MOTD presentation techniques into consideration. In other words, of the total information the technician will require, what portion must be recalled from memory during task performance and what portion should the technician obtain from MOTD during taks performance? The information should be determined by representatives of the training community and MOTD development. Other requirements include the need for a determination of whether the equipment/system will include BITE, ATE, or computer diagnostics; a determination of what types of training would be most advantageous to the user taking into consideration his capabilities and characteristics; a determination of the level of performance effectiveness expected of the user; a determination of how basic learning principles could be systematically applied in the design and development of training materials and MOTD; etc.

Table 4-I lists the requirements inherent in the User-Data Match. These requirements resulted from the analysis of current and proposed TM systems and through various discussions with informed sources with whom NTIPP representatives interfaced. This list is not intended to be all-inclusive; further research may very well uncover additional User-Data Match requirements

4.1 USER-DATA MATCH REQUIREMENTS (Continued)

TABLE 4-I. USER-DATA MATCH REQUIREMENTS

User-Data Match Component Information Requirements:

Objective: to specify the human factors considerations which should be incorporated into data acquisition specifications, policies, and procedures.

Personnel Characteristics:

- identify User's Navy rate, rating, and specialty within rating
- determine User's Basic Test Battery Scores (ARI, MECH, GCT)
- assess User's related on-the-job experience (years of)
- determine User's formal education
- determine User's Navy schooling/training completed
- etc.

Equipment/Systems and Task Analysis:

- comprehensive description of equipment/systems
- complete job task analysis of duties User must perform with respect to equipment/systems
- define and specify aspects of maintenance philosophy
  - level of fault isolation
  - meantime to repair equipment/system failure
  - existence of Bite, Ate or computer diagnostics
  - need for manual trouble shooting

Environmental Constraints:

- identify environmental variables which may impact User's ability to use and comprehend MOTD
  - illumination
  - wind
  - noise
  - dust
  - dampness
  - workspace constraints
  - etc.

Presentation Techniques:

- evaluate various forms of formats and components of formats to determine the appropriateness or effectiveness with which each presents specified types of data to the User. (Formats include JPA, FOMM, ITDT, etc/components of formats include use of proceduralized instructions, use of color diagrams/illustrations, use of theory, etc.)
- evaluate various forms of media to determine the appropriateness or effectiveness with which each presents specified types of data and formats to the User (media include paper manual, audiovisual, microform, video disc, etc.)

Content Generator User-Data Match Requirements:

Objective: to guide MOTD design and development so that all user needs are met effectively.

(these requirements are covered in greater detail in the Content Generation Requirements topic which follows.)

TABLE 4-I. USER-DATA MATCH REQUIREMENTS (Continued)

Data Acquisition User-Data Match Requirements:

Objective: to specify data acquisition rules, specifications, policies and procedures which provide explicit guidelines for use of User-Data Match model or methodology by the Content Generator, and suggest methods for collection of necessary information relative to use of model.

specify guidelines for conduct of Head/Data/Training Trade-Off (see additional discussion below)

specify guidelines on readability/comprehensibility of text and graphics (if possible)

Logistics Support Analysis User-Data Match Requirements:

Objective: to enable the critical decisions affecting MOTD development and training to be made based on most complete and accurate information.

- Personnel Characteristics
- Equipment/Systems and Task Analysis
- Environmental Constraints
- Presentation Techniques

} These requirements are basically the same as those listed under User-Data Match Component Information Requirements

- Training Considerations

} These are discussed in detail below under Head/Data/Training Trade-Off Requirements.

Head/Data/Training Trade-Off Requirements:

Objective: to enable the critical decisions to be made regarding how the User is to acquire the necessary knowledge and skills to satisfactorily operate/maintain the equipment/systems.

"Head Information Requirements":

- Amount and quality of User's formal education
- User's related job experience
- Navy schooling/training User has completed
- User's general capabilities (ARI, MECH, GCT)
- User's reading/comprehensibility level
- etc.

Data Information Requirements:

- determine total data content needed to support equipment/systems
- determine manners in which this data can best be transformed into useful MOTD (specified in terms of Format and Media techniques)
- etc.

Training Information Requirements:

- determine what portion(s) of total data content the user should acquire through training (information required to be recalled by memory), and what portion by MOTD, taking costs of various training types and various MOTD presentation techniques into consideration
- determine whether BITE, ATE, computer diagnostics will be present
- determine which types of training would be most appropriate considering User capabilities, data content, cost, etc.
- determine level of performance effectiveness expected of User
- determine whether MOTD can be developed for use in training also
- determine how basic learning principles could be incorporated into the design and development of training materials and MOTD
- etc.

4.2 DATA ACQUISITION REQUIREMENTS

The NTIPP requirements for data acquisition must provide for processes, and for guidelines, content, structure, and application for Navy policies and procedures concerned with TM acquisition and maintenance.

The NTIPP requirements for data acquisition were developed, in part, as a result of the research done in Task 1 of this study. Policy and procedure documents for all DoD components were searched for those items which each component addressed as requirements necessary for TM acquisition. All DoD components were visited, with emphasis on Navy SYSCOM's, to discuss actual practices. Another source of information was knowledge which Hughes Aircraft Company has gained over many years of preparing TMs for all DoD components.

In addition, TM specifications used by all DoD components were given a rigorous examination and analysis. First-hand knowledge of Hughes personnel experienced in the use of these specifications to generate various types of TMs was invaluable in this endeavor. Requirements for a wide range of TMs, content material for different maintenance activities, required coverage for various types of military equipment, and a multitude of TM processes were extracted as a result of this effort. Past and current studies of TM specifications performed by Hughes, RCA, Kinton, Hydrospace Challenger, and other companies for various DoD components were also consulted for new ideas in specification requirements. Other documents of interest to Task 2 which were collected during the Task 1 survey included experimental evaluations of concepts and techniques that have been developed and compared with other techniques. These and human factor studies, past and present, are significant in determining NTIPP requirements for data acquisition.

The results of a present NTIPP human factors subcontract with Anacapa Sciences, Inc., Santa Barbara, California, are expected to have major impact on the requirements for TM specifications. For this reason, TM specification requirements were defined to be broad enough in scope to accommodate these expected refinements. Refinements will likely include amplification of TM specification requirements in the areas of (1) what kind of materials a TM should contain, (2) how much, (3) to what level, and (4) how it can be most effectively presented. Table 4-II lists the data acquisition requirements.

These and other refinements to NTIPP data acquisition requirements will continue through other phases of this study. During the next phase of the program, baseline and alternate sets will be selected which satisfy these requirements.

In developing data acquisition requirements for NTIPP, it was necessary to consider the interrelationships among all elements from which the requirements evolved. While it would be exciting to believe that each requirement selection could be based on some exotic multifactor equation that properly weighs and balances various criteria to select the best requirement for each circumstance, it also would be a delusion to think this could be suitable for all individual elements considered. Due to the nature of many of the elements which comprise the requirements, many engineering judgment calls were necessary. Even with relatively unlimited time and money, it is unlikely that a mathematically contrived method for selecting one requirement element over another could be devised. With limited time and money, an understanding of the primary criteria for each requirement, i.e., what must it accomplish, along with some simple and straightforward methods of making necessary evaluative judgments,

is all that was needed in the majority of cases to select the NTIPP requirement for data acquisition which are suited to a variety of applications.

Policy and Procedure Requirement Considerations – A definition of NTIPP data acquisition policy and procedure requirements is necessary for future development of an all-encompassing NTIPP system. In the generation of these requirements, a discrete set of criteria were employed to ensure complete coverage of all aspects of technical manual acquisitions. This development of NTIPP requirements is a natural outgrowth of the efforts conducted in Task 1 of this study, and will subsequently provide the basis for the evolution of a baseline and alternatives. These requirements, once developed, were then subjected to further refinement and ratification.

One criterion in developing the NTIPP data acquisition requirements was to assess all relevant requirements of the Department of Defense, Secretary of the Navy, and Chief of Naval Operations that would or could be met within the developed framework. An equally essential criterion was to assure that the requirements could encompass any future pertinent advances in the state-of-the-art. An additional criterion was to assure that the developed requirements enveloped all the existing requirements contained in the various SYSCOMs without necessarily adhering to their extant degree or methods in function performance.

In the actual development of NTIPP data acquisition requirements, each of the individual SYSCOM requirements (which had been previously derived from the Task 1 analysis of various SYSCOMs and subsequently itemized) were functionally grouped without regard to the originator. Subsequent analysis of these functional groups, with some shuffling of requirements from one group to another, produced a listing of functional sets of detailed requirements. A single-sentence description at a higher level than but encompassing each of the contained detailed requirements for each set was then developed. A similar exercise was conducted for DoD, SECNAV, OPNAV, and NAVMAT requirements, and the resultant sentence listing compared to and interleaved with the SYSCOM listing. This single remaining listing was reviewed, refined and then evaluated for essentiality and intent of purpose.

These developed upper-level NTIPP data acquisition requirements will subsequently be utilized in preparing a baseline system description. They will provide the necessary framework to build the baseline, and will bound the development of potential alternative systems. Since they are high-level requirements, they allow adequate room for innovation in the system design, and are not restrictive as to techniques that could be employed in development. The baseline design and the alternatives will, of course, be subjected to trade-off studies and cost/effectiveness analyses prior to the finalization of the NTIPP design.

The NTIPP data acquisition policy and procedures requirements shown in Table 4-II primarily stress centralized management in TM acquisitions and maintenance. Inherent within the centralized management concept is the connotation of standardization. With the continued decrease during the past two decades in the size of our Navy and the continued increase in cross-utilization of aviation, surface and submarine personnel, a single standard for data acquisition is becoming increasingly necessary.

TM Specification Requirement Considerations – The requirements for technical manual specifications must contain the three basic elements of data transfer – content, format, and media. Content is the data that is to be transferred to the technical manual user; format is the means of organizing and

4.2 DATA ACQUISITION REQUIREMENT (Continued)

portraying such data for transfer; and media is the means for capturing the formatted data for retention and subsequent transfer to the user.

Content is the primary requirement, and depends on user needs. Content requirements are governed by equipment type, equipment complexity, user training and experience, and task requirements. The content requirements are independent of the format and media requirements. Format depends both on the content and media requirement, and is governed by the type of data that is to be transferred, the environment in which the data is used, the manner in which the data is used, the media by which the data is to be transferred, the training, experience, and skill of the user. Media requirements are governed primarily by the environment in which the data is to be used and by the content requirements.

In addition to the data transfer requirements, technical manual specification requirements must contain information on the scope, purpose, and applicability of the specification, quality assurance provisions, and preparation requirements. The scope, purpose, and applicability of the specification must define the type and purpose of the technical manual to be produced, and the equipment types to which the specification applies. Quality assurance provisions must contain inspection requirements and measures necessary during and after preparation of the technical manual to assure that the manual is complete, accurate, comprehensible, and usable.

Preliminary user-data match findings indicate that the use of short, simple words and a consistent style and format are necessary specification requirements. Liberal use should be made of examples and illustrations to demonstrate the requirements. The objectives, principles, and purpose of the requirements should be given in order to clarify the requirements. Reference to other specifications and documents for requirements should not be made unless all of the referenced requirements apply. If exceptions to referenced requirements are taken, they should be clearly spelled out. Specification requirements must tie the TM content requirements to a maintenance plan to assure that all data needed by the user is contained in the manual, and that all data contained in the manual is applicable to the user needs. In addition to containing the requirements for the data to put in the manual, specification requirements must contain guidelines on how to prepare the data.

TABLE 4-II. DATA ACQUISITION REQUIREMENTS

TM Specifications for Content

- Provide method to assure formulation and analysis of detailed equipment maintenance requirements to guarantee the completeness of a TM in supporting a commodity with data which is also usable by the skill level(s) for which the TM is designed.
- Provide guidance in the preparation of text and procedures for various equipment complexities vs amount of built-in-test features and relationships to maintenance philosophy and user skill levels.
- Provide description of various methods and techniques to encourage TM use, enhance user skills, and increase his understanding of his equipment and job.
- Provide flexibility in describing depth and scope of text which is best suited for commodities requiring data, and intended users of data, for both descriptive and maintenance information.
- Provide guidance on proper vocabulary usage and text structure for intended audience.
- *Define meaningful schedules for in-process* reviews and sample lots to be inspected.
- Provide definitive requirements for validation and verification of TM, criteria, scheduling, equipment required, and record keeping.
- Include comprehensive quality assurance procedures for content generator, in accordance with readability, comprehensibility, accuracy, and usability guidelines developed for user-data match.

TM Specifications for Format/Media

- Provide flexibility in describing types of illustrations which are best suited for commodities requiring data, and intended users of data, for both descriptive and maintenance information.
- Provide for effective use of illustrations in physical and functional descriptions with liberal use of keyed text/illustration relationships, as defined by user-data match.
- Emphasize both text and illustration examples and samples. Both "good" and "bad" examples should be included and all examples should demonstrate correctly the principles and techniques being illustrated or proposed.
- Provide flexibility and guidance in the use of existing meida presentation methods such as hard copy, microforms, audio-visual, or digital devices.

4.2 DATA ACQUISITION REQUIREMENTS (Continued)

TABLE 4-II. *DATA ACQUISITION REQUIREMENTS (Continued)*

- Provide definitive guidance in the requirements for TM structure and the inclusion of various TM elements, defined by user needs, format used, equipment complexity and intended environment of use.

- Provide coordination and requirements for timely generation and structure of material for multi-usage of TM in training classes, in-process reviews, and quality control sampling.

- Demonstrate user-data match requirements for formats to be used and their preparation.

- Provide for logical arrangement of TM content for ease of use.

- Provide for fast and easy access, comprehensive indexing, and simplified, as well as descriptive, numbering/divisions/titles/headings.

- Provide for flexibility and variety of type and fonts, explicit covers, paper and film grades, TM sizes, and packaging techniques for user need and environmental conditions.

TM Acquisition Policies and Procedures

- Provide command structure with necessary authority for the management, control, coordination, issue, and implementation of policies and procedures for the acquisition, and maintenance, of technical manuals to include:

  – Planning
  – Contractor/military interfaces
  – Requirements determination
  – In-process reviews
  – Validation/Verification
  – Change/update procedures
  – Reproduction
  – Distribution/stocking
  – Generation
  – Acceptance
  – Development
  – Recision

- Provide point of contact for Fleet and other Navy activities on TM matters.

- Provide control and cognizance over Navy TM research and development activities and maintain liaison with other DoD Service branches.

- Provide point of contact and implement procedures for accumulating itemized, accurate, cost data, liaison with CNM Comptroller on funding and budget matters, and dispersion and utilization of funds for TM acquisition, maintenance, and R&D.

- Provide control of policy documents, TM specifications, standards, contract documents, style guides, and handbooks; their issuance, update, applicability to individual procurements and processes and maintain liaison with other DoD service branches on related matters.

TABLE 4-II. DATA ACQUISITION REQUIREMENTS (Continued)

- Establish and maintain hardware-configuration and TM-configuration indexing or listings which are tied to various equipment change procedures and routine TM maintenance.
- Provide coordination and utilization of in-house capabilities for all Navy TM services.
- Provide control and point of contact for logistic guidance with hardware acquisition activities on all TM related matters.

4.3 CONTENT GENERATION REQUIREMENTS

Requirements for the Content Generation Research Issue are defined in order to constrain the baseline and alternative configurations of this functional entity within acceptable bounds of performance, feasibility, and affordability.

The content generating activity is normally a military contractor; however, it may also be a military agency in-house capability. This function is responsible for collecting the data, preparing technical publications planning documents, writing the TM, critiquing the TM and performing validation. Since a vast majority of Navy MOTD will continue to be developed by the military contractor, the content generation requirements focus on the organization, operational procedures, and performance capabilities of these activities. The intent of these requirements is the development of content generation baseline and alternative configurations, all of which have the capacity to produce acceptable Navy MOTD products in a cost/effective manner.

Content generation requirements must be flexible enough to accommodate contractor differences based on size, available resources, management philosophy, organization structure, hardware product line, and necessity to respond to customers other than the Navy. In this manner, no contractor that is capable of developing quality Navy MOTD products will be eliminated from consideration. Additionally, the Navy will not deplete its industry resource and decrease its options based on a possible reduction in the current number of contractor competitors.

At the same time, content generation requirements must be stringent enough to ensure Navy confidence that all contractors which are considered qualified to bid on MOTD contracts will be capable of delivering products which meet Navy standards of quality in a cost/effective manner.

The analysis of current and proposed technical manual systems revealed many variations in the characteristics of content generating activities. The personnel qualifications of MOTD generators, the extent to which MOTD development is subcontracted, and the level to which engineering/manufacturing data base development is automated are but a few of the areas where differences exist. As a result, the content generation requirements must lead to baseline and alternative configurations which are compatible with, and able to evolve from, current and proposed contractor configurations. The analysis of current and proposed TM systems also uncovered numerous content generation problem areas such as the lack of structured interaction among contractor activities involved in TM development, training, maintenance engineering and provisioning, and the failure of MOTD generators to have sufficient "hands-on" equipment experience as well as familiarity with the field maintenance environment. The content generation requirements are structured so that the resulting configurations will address all of these problems.

The requirements detailed in Table 4-III are arranged to coincide with the structure upon which the analysis of current and proposed content generation systems was based. Overall content generation issue requirements are presented first, followed by requirements for each of the six sub-issues – Engineering/Manufacturing Data Bases, Pre-Writing Tasks, Writing Tasks, Post-Writing Tasks, TM Presentation Techniques Handbooks, and Writer's Guides or Readability/Comprehensibility.

TABLE 4-III. CONTENT GENERATION REQUIREMENTS

Function/Subfunction	Functional Requirements
Content Generation	• Capability to develop MOTD using all type of presentation techniques – FOMM – JPA – Conventional (Full military specification and modified) – Work Package – Commercial – All others identified by User-Data Match • Capability to deliver MOTD within contractual time constraints • Capability to develop MOTD within established performance measures such as manhours per page unit constraints based on the following: – Presentation Techniques (FOMM, JPA, etc.) – System/Equipment Types and Complexity (Electronic, Mechanical, etc.) – MOTD Category (Theory of Operation, Troubleshooting, etc.) – MOTD Types (Narrative, Procedural, Graphics) • Capability to develop MOTD compatible with SYSCOM unique requirements – MOTD Guidelines (Specifications, Standards) – System/Equipment Types – Maintenance and Operating Environment – User Characteristics – Media (Paper, Microform, etc.) • Personnel Qualifications – Prime Contractor, Equipment Subcontractor, Data Houses – Formal Education (College, Trade School, Military School, etc.) – Experience (Hardware Related, MOTD Related, etc.) • Capability to develop and maintain TM presentation Techniques Handbooks and Writer's Guides on Readability/Comprehensibility (Text and Graphics) • Compatible with and able to evolve from current contractor and SYSCOM in-house activities with configuration flexibility to account for contractor differences in size and methods of conducting content generation activities

4.3 CONTENT GENERATION REQUIREMENTS (Continued)

TABLE 4-III. CONTENT GENERATION REQUIREMENTS (Continued)

Function/Subfunction	Functional Requirements
Content Generation (Continued)	• Provide quality assurance (in-process monitoring and final product review) which shall use developed tools (formulas, checklists, statistical sampling techniques, etc.) to insure MOTD compliance with established requirements – Limit Technical inaccuracies and grammatical inaccuracies to required levels – Determine compliance with requirements for completeness, consistency, level of detail, adherence to data acquisition rules, readability, comprehensibility, presentation technique, format, organization, and ease of access • MOTD requirements based on consideration of the following: – Criticality of Task – Complexity of Task – Frequency of Task Performance – Impact on safety to personnel or equipment – Cost of Equipment – Maintenance Philosophy – Media – Type of MOTD (Theory of Operation, Procedural Data, General Information, IPB, etc.) • Capability to provide system level coverage and system/equipment interface data where inadequately addressed in existing MOTD
Engineering/Manufacturing Data Base	• Military contractors hardware data base in accordance with engineering drawing specification MIL-D-1000A and standard MIL-STD-100B • Military contractor software data base in accordance with specified Navy guidelines (SECNAVINST 3560.1, WS-8506, DIDS, etc.) • Commercial contractor data bases compatible with development of MOTD to specification MIL-M-7298C (Commercial Manuals) • Currency and accuracy maintained via continual update and release of formal engineering change documents • Time phasing of data base development compatible with MOTD development cycle
Prewriting	• MOTD proposal responsive to RFP and also to include innovative alternative MOTD approaches, if required • Accurate MOTD cost estimate based on sufficient data (engineering) manufacturing data base, maintenance philosophy, MOTD requirements, requirements of other support activities)

TABLE 4-III. CONTENT GENERATION REQUIREMENTS (Continued)

Function/Subfunction	Functional Requirements
Prewriting (Continued)	• MOTD design disclosure and planning documents fully detailed and customized to particular systems/equipment based on Content Generator interface with training, maintenance engineering, provisioning, and design engineering. • Content Generator interface with Content Capture • Capability to avoid MOTD redundancies and perform head/data/training trade-off based on Content Generator interface with training and maintenance engineering
Writing	• Development of procedural data using actual hardware to be deployed in field • Selection of writers based on match of writers capabilities/experience and task • Capability to interface with design engineers • Adherence to validation/verification guidelines • Capability to develop MOTD in compliance with data acquisition contractual requirements (CDRL's, DID's, TMCR's, specifications, standards) • Capability to manage and monitor development of MOTD by subcontractors and equipment vendors • Capability to conduct IPR's • Accumulate detailed MOTD development cost data
Postwriting	• Capability to develop MOTD updates in compliance with data acquisition contractual requirements (CDRL's, DID's, TMCR's specifications, standards) • Compile program historical data (cost, problems – solutions, innovative presentation techniques and management approaches) • Capability to respond to user comments
TM Presentation Techniques Handbooks	• Detailed procedures for the development of all presentation techniques required by Navy SYSCOM's • Samples of all presentation techniques required by Navy SYSCOM's
Writer's Guides On Readability/ Comprehensibility (Text and Graphic)	• Formulas, guidelines, and statistical sampling techniques to measure readability/comprehensibility of text and graphics • Vocabulary lists

4.4. CONTENT CAPTURE REQUIREMENTS

Requirements for content capture must present the directions to define those functional elements of the baseline and alternatives structured for internal and external interfaces and standards, and accommodate the problem areas that face this research issue.

The long-range goal of this issue is to provide a content capture function for the Navy that can accommodate the output of the contractors, perform update from a central publications data bank, input and update internal publications using the same data bank, and output for all media (as determined). Also, it must communicate the content, manage it, and be consistent and common throughout the SYSCOMs. This is not an insurmountable task – the elements that exist have functional compatibility, and the organizations are not resistant to the approach.

Content capture requirements address several problem areas uncovered in the survey of current and proposed technical manual systems. These include the differences among SYSCOMs in their automation, or lack of it; the related factor of no common standards; the use of different media; the aim of working toward performing all update (after initial issue) from a publications data bank, and the time required to move from an agreed-upon concept through approval and funding cycles to implementation. The requirements are structured so all of these problems can be addressed as the requirements take form in the initial baseline and alternatives, and they will be further refined during the tradeoff and cost/effectiveness analysis.

In the list of problem areas, the more urgent of these is the need for the SYSCOMs to agree on some degree of commonality in their automation and standards, especially interface standards. Interface standards are critical if the internal automation development (or improvement) toward a MOTD data bank concept is pursued. In particular, the interface standard between the SYSCOMs and their contractors is required to provide cost/effective methods to simplify data flow from one contractor to more than one SYSCOM, and easy SYSCOM-to-SYSCOM exchange of contractor MOTD. Common standards can provide, to those still not automated, or ready to further sophisticate, a guide for directing their efforts toward a compatible system. Looking ahead, since the Army and Air Force are not as yet committed to an automation interface to contractors, the Navy can provide the leadership in the field of automation as it relates to this facet of MOTD processing.

The use of different media is a problem being compounded by unilateral actions in the SYSCOMs of pursuing separate media development programs. The previously stated-requirement for a Media Laboratory may be a solution to this problem. Although not a positive assurance that a medium will not be recommended that turns out to be ineffective, with a common media laboratory it is greatly minimized. More important, however, is the capability (within such a Laboratory) to assess and test a medium for its inherent attributes (or lack of them) and then, if warranted, apply that medium to all environmental or use situations using controlled and objective means. Being able to forecast media development could prevent costly excursions into what may turn out to be "short-term" media programs. Media standardization is part of the means, and media forecasting is an additional part, for the Navy to continually provide the user with MOTD in its most usable form.

Working toward the development of capabilities to perform all update will be affected by the progress in development of standards, automation interfaces and conformance by the contractors. The recent position paper relative to the threat of the NAVAIR Technical Review and Update of Manuals and Publications (TRUMP) system to contractors update of MOTD for in-production equipment issued by Aerospace Industries Association (AIA)[1] will also have to be considered as this requirement is defined in functional terms and synthesized in subsequent NTIPP tasks. Basically, whether the SYSCOMs perform all or only some of the updates, the automation interface is still a future requirement needed to support an MOTD data bank of in-production, out-of-production, or both categories of equipment.

The problem of the time needed to take the system design of a concept through the various approval cycles and then obtain funding has both positive and negative aspects. Time may be an ally if emerging technology can be qualified early as a viable approach, such as video disc or holograms as media, or satellite communications for MOTD delivery. Time permits refinement of such development with subsequent improvement in cost/effectiveness during approval and funding cycles, and before implementation. On the other hand, if sufficient foresight is not applied to the selection process, when it is time for implementation the selection may be out-of-date. There is a tendency to design in a "tried and true" state-of-the-art mode without considering that, potentially, there can be a several-year cycle before design becomes reality. Although NTIPP might use the time factor to advantage, concentration is still required on overall improvement to the approval/funding cycles. One area that needs to be assessed is the method of (or need for) obtaining approvals from other agencies such as the Joint Committee on Printing for "composition" equipment or the data processing organizations for "computer" equipment. Regardless of the attributes that are rationalized, the time from conception to implementation is too long. This problem area does not pertain only to the Content Capture issue.

There is a basic requirement of NTIPP to develop from existing capability within the Navy, providing it is cost/effective. Although not stated per se, the requirement to accommodate the NAVSEA Automated Documentation Preparation System (ADPREPS) and the NAVAIR TRUMP system now in use and in an upgrade mode is assumed and included. Specific functional parameters for these systems in relation to the NTIPP Content Capture of the 1980's will be considered in preparation of the baseline or alternatives in Task 3.

Table 4-IV lists the requirements, generally defined, that are needed to provide the functional elements both to work problem areas and to provide the means to serve the Content Caputre needs. They reflect not only the analysis of current and proposed TM systems and the resulting postulations, but they embody the thoughts and expressions of many with whom NTIPP research interfaced. Although broadly stated, the list provides the basis to develop the baseline and alternatives. Examples of means to meet stated requirements are provided for clarity. During the further baselining and the subsequent tradeoff and cost-effectiveness analysis the functional entities will be narrowed and the selected NTIPP Content Capture of the 1980's will be defined.

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[1] PUBS-100 Panel, "Navy TRUMP System Activation Circumvents OMBA-76," Aerospace Industries Association, October 1976.

4.4. CONTENT CAPTURE REQUIREMENTS (Continued)

TABLE 4-IV. CONTENT CAPTURE REQUIREMENTS

A. Content Capture Requirements Involving Interfaces Internal to the Issue:

1. To provide a netted, centrally controlled, localized structure of SYSCOM's publications capability with common standards, policies and procedures.

2. To provide (where possible), the ability to:

   a. Enter text and tabular material interactively in an automated system using such devices as a Visual Display Terminal (VDT) or standard keyboard terminal.

   b. Enter text and tabular material in a batch mode in an automated system using such devices as OCR or digital readers (tape, cassette, cartridge, diskette, paper).

   c. Enter graphic material interactively in an automated system using such devices as VDT, digitizer, and program function keyboard tablet.

   d. Enter graphic material in a batch mode (intelligent form) on an automated system using such devices as digital scanners.

   e. Edit, update, and format text, tabular and graphic material in an interactive mode using such devices as visual display terminals in an automated system with such features as:

      - Global locate and replace, delete, add, move, sort, and other change and process actions.
      - Measurement of readability and/or comprehensivility of text and graphics (as defined).
      - Extraction of tables of contents, lists of tables and illustrations, and selected indices.
      - Text and graphic merge.
      - Selected function coding for output media and digital conversion method.

   f. Store in working storage media such as disc or diskette, sufficient data to meet work-in-process needs.

   g. Output in digital form, the structured MOTD for conversion into media such as, hardcopy, microfilm, video disc, or holograms.

   h. Accumulate and report management information such as amounts and types of data being input, output, processed and stored; operating time and down time; and other machine, manpower, material, and related cost data.

   i. Prepare text, tabular, and graphics using conventional means (interim).

   j. Prepare audio/video media using such devices as television cameras and recorders, photographic cameras and processors, and audio recorders and players – (as determined).

TABLE 4-IV. CONTENT CAPTURE REQUIREMENTS (Continued)

B. Content Capture Requirements Involving Interfaces to External Functional Entities:

1. To provide the ability to accept from contractors such input as:

   a. Text material in digital form (with and without graphics) on magnetic tape (reel, cassette, cartridge), diskette, paper tape, as repro copy (with and without graphics), or copy prepared for optical character recognition (OCR).

   b. Graphic material in digital form (image or intelligent separate from text) on magnetic tape (reel or diskette), as repro art, or original artwork. (Also graphics integrated with text – see above.)

2. To develop program to assist contractors to convert to meet standards (from B-1, above).

3. Store in archrival storage media such as high density tape or solid state methods, the inventory of publications under local control.

4. Convert digital output into such media as repro copy, microform master, printing plate, video disc master, or hologram master using such devices as computer output microform, photocomposition, video disc and hologram mastering equipment. (Relates to Replication function.)

5. Communicate among central, localized, and user facilities, using such methods as mail, landline and wireless, the MOTD received by and created in NTIPP content capture. (Relates to the distribution function.)

6. To provide a controlled and compatible (to internal) structure of subcontractor capability in content capture functions such as, text and tabular processing, graphics processing, and digital conversion to media masters.

7. Provide a continuing technological assessment operation in content capture related disciplines such as text and graphic processing, media conversion, communications, computers, and mass storage. (Part of Media Laboratory requirement.)

C. Content Capture Requirements Involving Standards:

1. To develop standards of input for the above, such as

   Digital code
   Digital data format
   OCR input format
   Digital Media

   Note: Other form and format requirements are controlled by specification and contract requirements.

2. Provide quality assurance of products and processes through quality control structure such as text proofreading, art checking, and product inspection.

4.5 CONTENT REPLICATION REQUIREMENTS

Requirements for this issue must provide the direction to define the functional elements needed to perform required replication in the 1980's considering media changes, interfaces, transitional problems, standards, and other developmental concerns.

The requirements for the post-1980 replication issue must accommodate both the existing and the emerging methods of developing and delivering MOTD. There are present functions that become interim in the long-range scheme of NTIPP replication. As the media change, and as replication becomes more on-site/on-demand, the requirements lessen to provide replication at or near the point of content capture.

The overall goal of the replication issue is to provide the functions to take the output of a central publications data bank (of content capture) convert it, replicate it in various media (as determined), communicate it, and manage it. This task does not have some of the problems of other NTIPP issues such as standardization among SYSCOM's, as a centralized Navy organizational/functional structure exists that can accommodate the conceptualization of the NTIPP replication requirements. However, there are several areas of concern.

Among these areas of concern are the extensive use of subcontractors for replication services, the media impact and use of different media, the need for standards for new technology, the need for automation of functional elements, and the evolution from conventional replication to new concepts. These factors have been considered in the preparation of the general requirements so that their impact can be further assessed and accommodated as needed as the baseline and alternatives are defined.

Of primary concern to NTIPP replication is media selection. Since there are several potential media which likely will be narrowed down to one or two as NTIPP evolves, the functional requirements will also narrow. But even if a new medium such as video disc is determined to be the most effective, with the protracted time (a minimum of five years) to make the transition, conventionally printed manuals and microforms will still need to be supported in the early 1980's. Therefore, the narrowing process and transition dictates the requirement to continue to provide functional capability for the present media (printed books and microforms) in the interim. There is a likelihood that microfiche, just now being implemented in NAVSEA and NAVELEX (and for some MOTD applications by NAVAIR) could be in use well beyond 1980. If so, the NTIPP structure must accommodate the functional need and, therefore, a requirement is herein stated to cover this likelihood.

The use of subcontractors to provide most of the actual replication services (nearly 100% of printed MOTD) is another area of concern. If on-site/on-demand replication from digital media becomes a principal NTIPP method, the use of the existing structure of printers and micropublishers will decline. Replication of some digital/optic media will be needed with such potentially acceptable media as video disc or holograms, but the replication methods are relatively inexpensive (compared to printing) and attendent costs will reduce significantly. Since today's heavy use of subcontractors is not by choice – the Congressionsal Joint Committee on Printing (JCP) has "encouraged" use of commercial replication – the transition to new media replication will have to consider this factor. One potential approach, going directly to the user locale with the digital output of content capture via a communications channel, would essentially eliminate the need for delivery media. This would also eliminate the need for a replication middleman (the subcontractor). In this case, the

need for replication would still exist, but at the user's locale to provide the media the user would need to perform his assigned tasks. Other approaches would still need a replication middleman, but at best the role of the subcontractor will change in the future NTIPP.

Any redirection of replication into areas with computer (or automation) disciplines will need the benefit of standards and controls. Unlike the Content Capture issue, where automation to different standards has proliferated (internal to the Navy and external with contractors), the replication issue has the opportunity to start in control. Again, the key standards apply to interfaces. Should conversion from content capture digital output be performed on devices (such as computer output microform or photocomposition) under control of all replication organizational entities, the digital interfaces need to be compatible. Further, if the use of subcontractors continues into the future where replication may be in a digital media environment, standards then need to be applied to that interface also. Gnerally, in as much as automation will impact several areas of NTIPP (Content capture, distribution, feedback, system management) it becomes a co-requirement among the issues to provide a means toward providing consistant automation standards.

Also impacting replication requirements is the overriding control structure of the JCP and the Government Printing Office (GPO), and their charters in relation to the charters of the Navy Publications and Printing Services Office (NPPSO) and NAVSUP, the NPPSO parent organization. The charters are well defined, the control mechanisms well formed, but they appear to be somewhat rigid and inhibiting (to change) looking from the outside. Further, within the structure, some unilateral actions impacting NTIPP, such as recently announced NAVSUP R&D efforts in media technology, have been evident. These, although not counter to, can be duplicative to other NTIPP efforts. Since presently and in the future, cognizance for replication rests with NPPSO/GPO/JCP the requirement is to work this structure into the total NTIPP so it is responsive to the needs of NTIPP and the user community.

There is an overriding concern as NTIPP evolves from conventional media use and its replication into new concepts. The concern is more than just the time of the evolutionary process and the need to accommodate new and old media in an interim period. The replication functions now performing MOTD replication are comprised or organizations with established roles in the replication scheme. There are policies, procedures, and charters, as well as people and machinery and all the related costs to operate. As with the subcontractor's situation discussed above, the total role may change. When defined for the future, the new role would impact some or all of the cited factors. If so, then the factors of procedure, equipment, personnel, and most of all cost, come into play in the development and analysis of a baseline and alternatives. Substantiation of gross changes, particularly if a multi-million dollar investment is to be discarded before it approaches realistic amortization, can be most difficult and represents a challenge for tradeoff and cost/effectiveness analysis.

The requirements that are needed to provide the functional elements both to accommodate the areas of concern and to provide the means to serve the replication needs are presented in Table 4-V. As with other NTIPP issues, they reflect the analysis of current and proposed TM systems, and the thoughts and expressions of many with whom NTIPP research interfaced.

The list of requirements here is also broadly stated and contains items to support the interim multi-media situation NTIPP must face. Media defined for the user is but one facet of the problem. The potential for content to be captured

4.5 CONTENT REPLICATION REQUIREMENTS (Continued)

in one medium, stored in a second, transmitted in a third, and converted for use in still a different medium compounds the media question, particularly in the on-site on-demand approach to replication. Further, because change and conversion is likely to be slow, some media will remain in the system for a while even though it is being replaced. The refinement of the baseline alternatives in other research issues will identify media for the varied uses and consequently will permit the tradeoff and cost/effectiveness analysis to select the replication functional entities for NTIPP to accommodate those chosen.

TABLE 4-V. REPLICATION REQUIREMENTS

A. Replication Requirements Involving Interfaces Internal to the Issue:

1. To have a centrally controlled organizational/functional structure for replication to include on-demand requirements.
2. To provide the mechanisms to refine replication standards, policies, and procedures to meet total NTIPP requirements as defined.
3. To provide (as determined for NTIPP) replication ability to:
   a. Convert digital MOTD to media selected for use such as paper, microform, or visual display, routinely and on-demand in user locals (as determined).
   b. Convert digital input into media such as microform masters, *printing masters (plates), video disc masters, or hologram masters* using such devices as computer output microforms, photocomposition, video disc and hologram mastering equipment. (Relates to Content Capture function).
   c. Convert microform, repro copy, and lithographic negatives to printing plates using conventional contact and projection photographic/imaging means.
   d. Replicate in paper media from the above, collate, and bind using such conventional devices as printing presses, collaters, stitchers, etc.
   e. Convert repro copy to microform masters using conventional photographic means.
   f. Replicate from microform masters using such methods as silver halide, diazo, and vesicular.
   g. Relicate from digital-form masters such as video disc or hologram masters using such methods as disc pressing or film duplicating methods of silver halide, diazo, and vesicular.
4. Accumulate and report management information such as amounts and types of data being replicated, and other machine, manpower, material, and related cost data.

TABLE 4-V. REPLICATION REQUIREMENTS (Continued)

B. Replication Requirements Involving Interfaces to External Functional Entities:

1. To provide the ability to accept from contractor or internal content capture functions such input as:

   a. MOTD created as repro copy,
   b. Lithographic negative or printing plates,
   c. Microform masters, fiche or roll and
   d. Digital form masters such as tape, diskette, video disc, hologram, etc. (to be determined).

2. To develop program to assist contractors to convert to meet standards (from 2, above).

3. To broaden replication control mechanisms to accomodate digital/optic media delivery and conversion.

4. Communicate the MOTD received by and processed in NTIPP replication among central, localized, and user facilities, using such methods as mail, landline, and wireless. (Relates to distribution function.)

5. To provide a controlled and compatible (with internal) structure of sub-contractor capability in replication functions such as conventional paper media printing, microform processing, digital conversion to digital media masters, and their duplication.

6. Provide a continuing technological assessment in replication disciplines such as media conversion, media reproduction, and automation of replication entities (Part of Media Laboratory requirement).

C. Replication Requirements Involving Standards.

1. To assist in development of standards for digital data such as:

   a. Digital Code
   b. Digital data format
   c. Digital media

   NOTE: Other form and format requirements are controlled by specification and contract requirements)

   (See Content Capture Requirements)

2. Provide quality assurance of products and processes through a quality control structure such as in-process and final product inspection.

4.6. DISTRIBUTION REQUIREMENTS

Requirements of distribution are primarily to deliver MOTD to the user utilizing the most efficient, cost-effective methods, maintain an up-to-date MOTD configuration index of all users, and provide a vehicle to expedite the delivery of all Feedback Reports (FBRs) and FBR responses between the user and the SYSCOMS.

Distribution requirements must address certain problems uncovered during the study of the present and proposed distribution systems. These include the lack of a centrally controlled distribution and storage system, the lack of a user MOTD coordinator, the existence of a multitude of storage points for MOTD, and a need for an up-to-date MOTD configuration index for each user.

The ultimate requirement is to provide a distribution system and a storage system that will be controlled with storage facilities strategically situated to provide rapid delivery and good availability to the user. The distribution system will respond to the number and type of MOTD required by the user, deliver the MOTD at the desired time, establish controls of distribution from a continuing system evaluation, and utilize the most cost-effective, timely methods of distribution. The storage system will have an active and inactive multimedia storage capability that will use a MOTD index numbering system common to all SYSCOMs.

The present system divides the MOTD distribution responsibilities between two separate organizations – the SYSCOMs and NAVSUP (Navy Supply). During equipment acquisition, the SYSCOM Program Manager provides a distribution list to NPPSO (Navy Publications and Printing Services Office) for delivery to the user. All extra bulk copies are stored at NPFC (Navy Publication and Forms Center) to await any replenishment requests from the user via the NAVSUP route. One proposed distribution system being studied is totally dependent on the use of new digital media for replication at the user or storage site, but the split responsibility of distribution will still be retained.

The requirement for a centrally managed distribution system would alleviate the split-responsibility problem and establish a control point to continually be responsible for the distribution process. The requirements for the distribution system will provide for a continual evaluation of the user's MOTD needs (both initial and replenishment); a verification of distribution of MOTD to the user; a control and evaluation of each facet of the distribution cycle; and the proper utilization of the most expeditious, cost-effective distribution methods.

The distribution system will be further enhanced by the requirement for maintaining an up-to-date MOTD configuration index for each user, plus the periodic distribution of a configuration report to each user. This MOTD configuration index will assist in evaluating the user MOTD needs, and can also be used by the user as a checklist against the delivered MOTD.

Control and evaluation of the distribution system and storage system will be accomplished by the requirement for periodic MOTD status reports. The status reports will provide the total amount of MOTD distributed and the total amount required to restock the storage facilities to proper levels. The information in the status reports will be used to establish and maintain proper MOTD storage levels to accommodate user replenishment requirements.

As user FBRs will be the prime interfacing instrument between the user and the SYSCOMs, a controlled FBR delivery vehicle between the two is a "must" requirement. The requirement will establish a system to control and track the FBR from the time it leaves the user work area until the delivery of the FBR response back to the user work area. Any portion of the cycle that slows the resolution of the FBR will be exposed and reported.

The user MOTD coordinator requirement will provide control of the MOTD after delivery. The coordinator will verify delivery to the proper work center, and will be responsible for all outgoing FBRs and incoming FBR responses.

The primary storage center for all bulk copies of MOTD is now NPFC – part of a system which, historically, has been slow in reacting to MOTD requests from the user. A requirement exists for a centrally controlled distribution center which will provide a more responsive, available system.

The centralized storage system will contain an active and an inactive data bank, and will utilize a MOTD index numbering system common to all SYSCOMs. The active storage data bank will pertain to deployed operational systems, and will be maintained in hard copy, digital, and microform media. The inactive storage data bank will be historical data on unused systems, and will be maintained in media determined to be most cost-effective.

The present method of restocking MOTD at NPFC is to wait for depletion of bulk copies, and then request NPSSO to order a large quantity of hard-copy manuals. Delays in deliveries of MOTD will be removed as the publishing media of future MOTD tends toward digital media and on-demand replication. The use of digital media will allow the storage system to replicate any number of copies, or to send a master copy to the user for his replication.

TABLE 4-VI. DISTRIBUTION REQUIREMENTS

1. Provide a centrally managed system to distribute MOTD from strategically located points that will:
   a. Evaluate user MOTD requirements,
   b. Distribute MOTD to the user,
   c. Control all facets of the distribution cycle, and
   d. Utilize the most efficient, cost-effective distribution methods.
2. Maintain an up-to-date MOTD configuration index for each user.
3. Provide Periodic MOTD configuration management reports to the user.
4. Provide a controlled vehicle for transferring feedback reports (FBRs) and FBR responses between the user and the SYSCOMs.
   a. Total number of FBRs processed,
   b. Status of unresolved FBRs,
   c. Disposition of resolved FBRs, and
   d. MOTD requirements.
5. Provide a user MOTD coordinator.
6. Maintain proper MOTD storage levels for user requirements,
7. Provide a centrally controlled multimedia storage facility for both active and inactive data banks.
8. Provide capabilities for replication of limited quantity MOTD requests.

4.7 UPDATE REQUIREMENTS

The MOTD update research issue requirements must address certain problems uncovered during the Task 1 effort. These problems include a lack of configuration control, separate approaches for automation of content capture, and similar but separate update functions for each SYSCOM.

The update issue requirements must include the addition of a viable, continuing configuration control function that will be available for the MOTD update cycle. The configuration control function would provide a list of the equipment each user is responsible for, the current change status of each equipment, and an inventory of the TM the user is maintaining. Additional information the configuration control function could provide is environmental data about where the MOTD is used and the storage area requirements for the MOTD. The environment and storage information could be utilized to make a change of media that would be more compatible to a special work center environment or storage requirement.

At present, MOTD for in-production equipment and out-of-production equipment is updated by different methods. The in-production equipment MOTD is normally updated by the equipment manufacturer, while the out-of-production equipment MOTD is the responsibility of the SYSCOM's field support offices. The actual updating of the out-of-production MOTD is accomplished by the SYSCOM field support office, if the capability exists, or by sub-contracted data houses. The update issue requirements must look at the separation of the updating functions and find the most feasible, cost-effective method of updating the in-production and out-of-production equipment MOTD.

Presently, investigations have shown that future media requirements will change the predominant hard-copy media to a digital or microform media. There will still be a possible need for hard-copy media to satisfy a specific work center environment requirements; hence, update issue requirements must address the problem of MOTD updating in multimedia. Updating could be accomplished by distributing master copies in digital or microform media and providing the replicating function at the user site in the media required.

Normal updating occurs only when a sufficient number of changes to the equipment or the MOTD warrant it. The update issue requirements must cover the need for a fast-reacting emergency updating function. An emergency request will normally originate with a user feedback report, and will reveal a MOTD related condition that is hazardous to personnel or destructive to the equipment. Though the problem will be answered by the feedback function, it is imperative to update the MOTD as soon as possible to remove any dangerous data from the MOTD.

Normally the primary reason for MOTD update is a change in equipment configuration. At the same time, an attempt is also made to remove any noted data inaccuracies and to improve any inconsistent presentation methods or MOTD organization problems. The update issue requirements must cover the possibility of having a continuing updating function to provide the most up-to-date, complete and correct MOTD for the user.

One of the present problems affecting the updating of MOTD is the lack of funds to accomplish the task. As this will be a continuing problem, the update issue requirements must address the use of new media or automation methods that will allow faster-reacting updating.

Automation is being approached separately by the SYSCOMs, and is presently being used only with out-of-production equipment MOTD. The update

issue requirements must verify the most feasible approach to automation of both in-production equipment and out-of-production equipment MOTD.

To most effectively use the available TM funds allocated, a TM update priority system must be developed and established. This priority system will evaluate the importance of the equipment-user primary mission, the population of the equipment, the life-expectancy of the equipment, and the urgency of any reported discrepancy. The use of prioritization will allow the more important TM's to be updated first and allow more expeditious use of available resources.

TABLE 4-VII. UPDATE REQUIREMENTS

- Provide an MOTD update system for:
  - In Production Equipments
  - Out of Production Equipments
  - All Types of Media
  - Emergency Requests
  - Equipment Changes

- Provide an update system that:
  - Is responsive to the MOTD user
  - Reacts to update need in a timely manner
  - Employs the most cost-effective methods and techniques for update (compatible with original content capture)
  - Uses automated methods for processing and management data (compatible with original content capture)
  - Has a controlled management function
  - Provides quality assurance (in-process monitoring and final product review) which shall use developed tools (formulas, statistical sampling techniques, etc.) to insure MOTD compliance with established requirements

- Provides a method for compiling program historical data (costs, problems-solutions, innovative presentation techniques and management approaches)

- Provides an MOTD update prioritization system

- Provides a configuration control function to the MOTD update system.

NOTE: Update requirements generally relate to and parallel those of the Content Capture Research Issue and Content Generation Research Issue.

4.8 FEEDBACK REQUIREMENTS

The feedback requirements must address both reporting and information-gathering techniques tied to centralized and authoritative systems for communications, analysis and corrective action. Acknowledgement to the reporter (user) is also important.

The objective of the feedback system is to provide the means for the user of MOTD to report discrepancies, and for the mechanisms to be provided so that the reported information can be acted upon. The feedback system must also provide the capability to gather information to support the reporting system. The tendency of a reporting system is nearly always to report the critical problems and less frequently report the more minor problems. An information-gathering system will tend to uncover the other-than-critical problems. To adequately assess the relative value of the MOTD, its accuracy and completeness (usability) both types of systems should be employed. This is a stated requirement on the accompanying list of requirements.

The basic elements of a feedback function are included in the requirements. Gathering/reporting information; analysis, evaluation, and measurement; corrective action; communications; and acknowledgement are provided for. The principal areas of concern are those related to the diversity of existing discrepancy reporting systems, as there is no central Navy control structure in this area, and the communications needs of an effective feedback system.

In regard to the existing discrepancy reporting systems for MOTD, they range from an old method of uncertain effectiveness to a new method yet to be evaluated. The old method uses the comment sheet bound into printed manuals, while the new method has a separate deficiency report form (locally available). There are other methods, previously discussed in the NTIPP Task 1 report, but these two are the principal on-going MOTD reporting systems. The overall effectiveness of each may be high or low; no statistical data was uncovered during NTIPP research. The effectiveness of the several types of methods used, including the above, needs to be determined to define this key element of a feedback system. The feedback organizational/functional structure must provide the capability (or direction) to perform this R&D. It follows that when the most effective methods and techniques are determined and developed, they should be employed throughout the Navy.

Tying together all of the interfaces of a feedback system requires an available efficient communications capability. It must be easy for the reporter to get his report of discrepancy to the point where action can be taken. Generally, this link in the network must be through some levels of local authority to maintain an information chain. This is often a single individual or office which is assigned the responsibility to monitor deficiency (or even efficiency) operational data. There should be no delays. This link is used for the return corrective action cycle, and also for the acknowledgement to the reporter, both of which are equally important.

One approach to consider for feedback is to use the distribution network for feedback communications, since it already connects the user to the source of MOTD. However, no matter how good the communications element, the feedback system will not satisfy its overall requirement without its other functional elements. An authoritative structure must exist to insure the corrective measures are taken and acted upon to satisfy the seriousness of the discrepancy. The present priorities for critical or urgent corrective action should remain. Less

critical defects in MOTD, now corrected routinely, may need two time cycles – one for content items such as missing (but not critical) information, and another for mechanical items such as typographical errors which do not affect context. Also very important is to provide an acknowledgement system so that the reporter, and those he relates with, know the system is working. This can increase credibility and provide a stimulus to the use of the system.

All of these elements, along with consideration of existing systems and centralization factors, will be included as the baseline and alternatives are defined, analyzed, and compared in developing the NTIPP feedback system of the 1980s.

TABLE 4-VIII. FEEDBACK REQUIREMENTS

1. To provide a standardized system for user feedback with common methods, policies, and procedures.
2. To develop standard information reporting/gathering mechanisms, using combinations of techniques such as user-initiated forms, forms accompanying media, mail-back survey questionaires, and person-to-person surveys.
3. To develop and provide the organizational/functional capability to analyze, evaluate, and measure discrepancy (or other TM-related data to determine and report needed action, monitor program, record for trend analysis, continually assess feedback system effectiveness, and perform R&D in all functional areas of feedback systems.
4. To develop and provide timely and effective corrective action mechanisms to implement the needed actions, using such methods as direct communications to users for imperative action, and normal routine communications media for other corrective action.
5. To develop and provide methods of acknowledgement to participants in the discrepancy report program using routine (but time-limited) communications.
6. To provide communications to net the user (discrepancy reporter) to the source of MOTD through the layers of organizations and related authorities as needed for reporting/gathering, corrective action, and acknowledgement, using such means conventional communications channels and considering adoption of the MOTD distribution network.
7. To accumulate and report management information such as numbers and types of discrepancies, time of response, trends, and program costs, and other related data.

4.9 INTEGRATION REQUIREMENTS

The integration issue encompasses all the requirements necessary to implement NTIPP as an operational system. These requirements provide the basis for NTIPP administration, coordination of interfaces among various NTIPP elements, and coordination of NTIPP interfaces with the weapon system acquisition process and integrated logistic support activities.

Integration requirements for NTIPP administration, shown in Table 4-IX, provide for analysis, coordination and support of the operational system. These requirements are allocated and structured to enable NTIPP to produce MOTD efficiently and economically. They establish uniform guidance for the preparation of MOTD that meets the user needs, and ensure that delivered MOTD reflects the correct equipment configuration.

The System Management function provides for budgeting, distribution of funds, and staffing of the TM acquisition activities. Additionally, higher level interfaces with Navy, DoD and industry representatives, critical to efficient NTIPP operation, are accomplished by this function.

The purpose of the System Engineering function is to produce the specification architecture which sets the policy and guidance necessary for the production of detailed specifications at the TM acquisition activities. This approach provides uniformity of MOTD content treatment while allowing for differences in detailed treatment of MOTD for particular user/equipment needs.

The Research and Development function investigates new hardware developments, assess new findings in the field of human engineering, and serves as an MOTD presentation media evaluation laboratory.

The policies and directives that coordinate the activities of the NTIPP elements are issued by the System Design functions. Additionally, this function is responsible for modifying the NTIPP design in order to maintain and improve efficiency as system requirements change.

The TM Utilization function monitors user feedback reports and hardware configuration status reports in order to ensure that required MOTD updates are implemented and distributed to the field.

The current lack of valid TM cost data dictates that cost monitoring, in-depth analysis, life cycle cost synthesis and other cost type information be made available for Navy-wide use. The Cost Analysis/Forecasting and Reporting function performs these tasks, as well as monitoring of NTIPP element costs in order to maintain their cost-effective structure.

The rationale and requirements for NTIPP interfaces with the Weapon System Acquisition Process and Integrated Logistic Support Activities are detailed in Section 3. These requirements, both reactive and derived, are summarized in Table 4-IX.

TABLE 4-IX. INTEGRATION REQUIREMENTS

NTIPP ADMINISTRATIVE REQUIREMENTS

General Requirement	Detailed Requirement
• System Management	• Staffing of TM Acquisition Activities • Budgeting and Distribution of Funds • Coordination of NTIPP Activities with Navy, DoD, and Industry • Long Range Planning
• System Engineering	• Specification Architecture • TM Element Design • User-Data Match Implementation • Head/Data/Training Trade-Off Implementation
• Research and Development	• Hardware Technology Assessment • Human Engineering Assessment • Industry Research and Development Interface • Media Evaluation • Logistic Support Technology Assessment
• System Design	• TM Effectiveness Evaluation • Policy and Directives • Coordination of Interfaces Among Various NTIPP Elements – Data Acquisition – Content Generation – Content Capture – Content Replication – Distribution – Feedback – Update
• TM Utilization	• Configuration Management • Distribution Policy
• Cost Analysis/Forecasting and Reporting	• Life Cycle Costs • Cost Monitoring – TM Costs – NTIPP Costs

4.9 INTEGRATION REQUIREMENTS (Continued)

TABLE 4-IX. INTEGRATION REQUIREMENTS (Continued)

CONCEPT FORMULATION PHASE	
Reactive Requirements	Derived Requirements
• Define MOTD requirements with respect to the operational and support capability of proposed system	• Formulate general MOTD requirements to support proposed system based on: – System complexity – System maintainability characteristics – User characteristics – Environmental characteristics – Maintenance philosophy – Maintenance task characteristics – MOTD presentation media – MOTD presentation techniques – Number of systems
• Establish candidate MOTD concepts derived from analysis of general MOTD requirements	• Formulate MOTD guidance concepts as follows: – Develop publications tree – Perform Head/Data/Training Trade-off – Perform User-Data Match – Define readability/comprehensibility requirements for text and graphics – Define presentation medias – Define distribution methodology – Define validation/verification parameters – Define update methodology – Define feedback origins and methodology
• Select viable MOTD concepts for consideration during validation phase	• Perform gross cost/effectiveness analysis bounded by affordability and capabilities of existing support system
• Develop planning necessary to implement MOTD concepts for proposed system	• Formulate for development and production of MOTD concepts as follows: – Schedule review of publication planning documents – Schedule in-process reviews – Schedule draft MOTD completion – Schedule validation/verification – Schedule final MOTD delivery – Schedule update cycles

TABLE 4-IX. INTEGRATION REQUIREMENTS (Continued)

VALIDATION PHASE

Reactive Requirements	Derived Requirements
• Develop formal MOTD requirements which meet proposed system support concept	• Establish specific MOTD development requirements for support of proposed system as follows: – Validate preliminary data used to formulate general MOTD requirements – Finalize MOTD guidance concepts – Select family of MOTD specifications
• Establish criteria for assessing compliance with MOTD development requirements	• Define criteria for evaluation of proposed approaches with respect to meeting MOTD requirements as follows: – Assess risks – Establish risk boundaries – Establish MOTD test parameters – Establish validation/verification parameters – Prepare MOTD input to RFP
• Evaluate proposed approaches for adherence to MOTD requirements based on established criteria	• Perform trade-off analysis of MOTD proposals based on: – Publications tree coverage – Validation/Verification plan coverage – Compliance with User-Data Match, training, and maintenance philosophy requirements – Recognition of impact of other related support elements – Management risks – Cost – Cost control – Cost collection

4.9 INTEGRATION REQUIREMENTS (Continued)

TABLE 4-IX. INTEGRATION REQUIREMENTS (Continued)

FULL-SCALE DEVELOPMENT PHASE	
Reactive Requirements	Derived Requirements
• Establish interface with selected contractor to provide guidance and insure compliance with stated MOTD concept	• Review and assess contractor plans and schedules for the following: – Inherent risk in plans and schedules – Maintaining costs within established bounds – Completeness of publications tree coverage – Identification and development of additional equipment manuals – Compliance with established User-Data Match, training, maintenance philosophy criteria – Consideration of impact of other related support activities – Validation/verification considerations
• Conduct in-process reviews to insure contractor compliance with established plans and schedules, and to assess compatibility with overall system development	• Review and assess the following: – Variance from established plans and schedules – Risks incurred and anticipated – Costs incurred and anticipated – Actual compliance with User-Data Match, training, and maintenance philosophy criteria – Actual impact of other related support elements on MOTD development – Cost and schedule reporting
• Review preliminary MOTD and verify compliance with requirements	• Assess preliminary MOTD with respect to the following: – Compliance with stated requirements – Variance of risks form prescribed bounds – Cost variance – Schedule variance – Variance from User-Data Match, training, and maintenance philosophy criteria – Variance from planned impact of other related support activities – Compliance with validation/verification criteria – Plans and schedules for user feedback and update

TABLE 4-IX. INTEGRATION REQUIREMENTS (Continued)

PRODUCTION/DEPLOYMENT/SUPPORT PHASES	
Reactive Requirements	Derived Requirements
• Establish plans and schedules for production of final MOTD	• Review and assess contractor plans and schedules for the following: – Risk acceptability – Cost bounds and acceptable variables – Completeness of publications tree coverage – Compliance with established User-Data Match, training, and maintenance philosophy criteria – Consideration of impact of other related support activities – Validation/Verification considerations
• Conduct in-process reviews to insure contractor compliance with established plans and schedules	• Review and assess final MOTD preparation with respect to the following: – Risk management – Cost management – Compare MOTD completed to date with finalized publication tree – Variance from User-Data Match, training, and maintenance philosophy criteria – Variance from planned impact of other related support elements – Validation/verification status
• Review final MOTD • Verify compliance with requirements	• Assess final MOTD with respect to deviation from plan as follows: – Risk variance – Cost variance – Variations from final publications tree – Variance from User-Data Match, training, and maintenance philosophy criteria – Variance from planned impact of other related support elements
• Replicate and distribute final MOTD to using activities	• Implement plans for final MOTD replication and distribution as follows: – Training activities in accordance with training schedules – Fleet user activities in accordance with equipment deployment schedule – Cognizant support and administrative activities storage
• Establish feedback channels for monitoring MOTD user complaints and initiate update cycle	• Implement user feedback and MOTD update cycle – Evaluate effectiveness from User-Data Match and training viewpoints – Evaluate quality control effectiveness – Assess required corrective actions

SECTION 5
REFINEMENT AND RATIFICATION OF NTIPP REQUIREMENTS

5.1 PROVISIONS FOR NAVY REVIEW OF NTIPP REQUIREMENTS

The principal mechanism for Navy review of the preliminary NTIPP requirements was individual review of the draft Task 2 report, coupled with joint discussion and coordination at the February 1977 NTIPP In-Process Review. To enhance this set of NTIPP requirements, reviewers were encouraged to indicate modifications, additions, and deletions as appropriate.

A thorough Navy review of preliminary NTIPP requirements is critical to the subsequent phases of NTIPP Phase I, since these requirements serve as the chief means for qualifying Task 3 alternatives as viable candidates for consideration in the iterative baseline process. Instructions to Navy reviewers were contained in a cover letter accompanying the report, over the signature of NTIPP Technical Director R. A. Sulit, David W. Taylor Naval Ship Research and Development Center, Code 186A, dated 18 January 1977.

Review comments generated under provisions of the above-referenced cover letter were invoked at the NTIPP In-Process Review on February 16-17, 1977, at the contractor's facility in Fullerton, California. After discussion, appropriate additions deletions, and modifications were incorporated into the preliminary NTIPP requirements documented herein. The resultant agreed-upon requirements exist in the form of this final issue of the Task 2 report.

SECTION 6
CONCLUSIONS

In developing the NTIPP requirements, it was noted that current ILS literature relating MOTD to system design is inadquate in scope and totally lacking in definitive application guidance. The critical nature of the Head/Training/Data Trade-off requires consideration be given to adding definition to ILS documentation.

A major effort of this task was to review the interface between the Weapons system Acquisition Process (WSAP) and to postulate as requirements the MOTD steps analogous to milestones in the system design process. Initial steps concerning the definition of MOTD in the Concept Formulation of a given weapons are related to the system complexity, user-data match, training, specification, and maintenance philosophy. It is evident that NTIPP cannot accomplish these steps without considerable rapport with the other "ILS Disciplines." A Head/Training/Data trade-off cannot proceed without definitions and input from those concerned with training and personnel. These entities may be fully prepared to respond to this need most effectively; however, evidence to support this need could not be found. Thus, it is concluded that an actual Head/Training/Data Trade-off cannot really be accomplished unless the other disciplines are capable of providing the needed input.

It was also necessary to consider the "ILS Discipline" in some depth as the link transform between NTIPP and WSAP. ILS documentation is sadly lacking in detail as to what actions should be taken in the early stages of WSAP and the "how to" words are totally lacking.[1] In many cases, the ILS literature is detailed in support of production hardware in that it is a continuous restatement of the obvious. The effort to date on NTIPP has focused upon the MOTD requirements. Wherever interfaces to other disciplines are detected, these have been noted. It is beyond the purview of NTIPP to develop the processes necessary for these related areas to achieve an effective interface; however, many interfaces are felt to be sadly lacking from a responsive viewpoint.

In addition to the absence of "how to" words in the ILS documentation, there is an absence of criteria to determine the qualification of the personnel who will accomplish these specialized tradeoffs in WSAP. Often the ILS planning literature refers to an "ILS team," but nothing exists on the composition of this team or the sources from which personnel will be selected. Further, nothing addresses the skill levels of the team players; apparently anyone with some "Technical Data" or "Training" background is a qualified candidate. It is unclear as to what qualifications criteria a Program Manager would apply to selecting the personnel to make up a given "ILS Team." Considering the lack of intelligible direction, it is little wonder that ILS as a discipline has been talked about for 12 years with little results that can be objectively evaluated.

It is clear that a Head/Training/Data Trade-off is essential to the development of "matched MOTD." This tradeoff is based upon the task analysis, the type of job, the frequency, criticality, complexity, etc. Currently, the ILS approach places task analysis in the MEA or ILS world, training in the training world, and MOTD in the "technical manual" world. Yet, these must be effectively related to develop the rules to achieve a "user-data match." There is no question that this type of tradeoff can be made in the "experimental" mode by carefully selecting the team and the target system/equipment; yet one wonders if the "real world" with three distinct organizational interfaces can effectively accomplish this trade-off routinely.

1. NAVMATINST 4000.38 "Standard Integrated Support Management System," January 26, 1976.

SECTION 7
RECOMMENDATIONS

Section 7 – Recommendations

To avoid biasing the baseline design, the recommendations presented here treat with aspects that impact NTIPP, yet fall beyond its purview.

- A far more structured and cohesive approach which treats ILS as the transform to relate the support technologies to the Weapons System Acquisition Process (WSAP) is essential.
- Qualification criteria for selecting ILS team members should be developed and applied.
- Development of training and personnel selection criteria should be undertaken to ensure that an effective User-Data Match can be achieved in the Head/Training/Data Trade-Off process.
- Effort should be expended to provide specific ILS events relative to WSAP, and specific methods of for accomplishing the studies supporting these events should be determined.

APPENDIX A
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Appendix A

REFERENCES

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APPENDIX B
GLOSSARY

Appendix B

GLOSSARY

Abbreviation or Acronyn	Full Terminology
	-A-
ADPREPS	Automated Document Preparation System
AIA	Aerospace Industries Association
ARI	Arithmetic Reading Index
ATE	Automatic Test Equipment
	-B-
BITE	Built-In Test Equipment
	-C-
CDRL	Contract Data Requirements List
CNM	Chief of Navy Material
COM	Computer Output Microform
	-D-
DID	Data Item Description
DoD	Department of Defense
DSARC	Defense System Acquisition and Review Council
	-F-
FBR	Feedback Report
FOMM	Functionally Oriented Maintenance Manuals
	-G-
GCT	General Classification Test

-I-

ILS	Integrated Logistic Support
IPB	Illustrated Parts Breakdown
IPR	In-Process Review
ITDT	Improved Technical Documentation and Training

-J-

JCP	Joint Committee on Printing
JPA	Job Performance Aids

-L-

LCC	Life Cycle Cost
LSA	Logistic Support Analysis

-M-

MEA	Maintenance Engineering Analysis
MECH	Mechanical Comprehension
MDC	Maintenance Dependency Charts
MOTD	Maintenance and Operating Technical Data

-N-

NAVAIR	Naval Air Systems Command
NAVELEX	Naval Electronics System Command
NAVMAT	Naval Material Command
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply Systems Command
NPFC	Navy Publications and Forms Center
NPPSO	Navy Publications and Printing Services Office
NTIPP	Navy Technical Information Presentation Program
NTMS	Navy Technical Manual System

	-O-
OCR	Optical Character Recognition
OPNAV	Chief of Naval Operations
	-P-
PMS	Planned Maintenance System
	-R-
RCA	Radio Corporation of America
R & D	Research and Development
RGL	Reading Grade Level
RFP	Request for Proposal
	-S-
SECNAV	Secretary of the Navy
SECNAVINST	Secretary of the Navy Instruction
SFTOA	Systems and Feasibility Tradeoff Analysis
SYSCOM	Systems Command
	-T-
TM	Technical Manual
TMCR	Technical Manual Contract Requirements
TRUMP	Technical Review and Update of Manuals and Publications
	-U-
UR	Unsatisfactory Report
	-V-
VDT	Visual Display Terminal
	-W-
WSAP	Weapon System Acquisition Process

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